This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

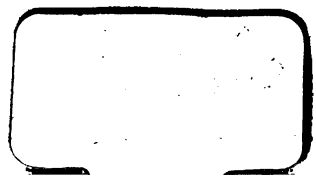
+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`



TRANSACTIONS OF THE

SECTION ON

Preventive Medicine and Public Health

of the
American Medical Association
at the Sixtieth Annual Session, held at Atlantic City, N. J., June 8 to 11, 1909

AMERICAN MEDICAL ASSOCIATION PRESS
CHICAGO: NINETEEN HUNDRED AND NINE

Reprinted from
THE JOURNAL
of the
AMERICAN MEDICAL ASSOCIATION

Copyright 1909
by the
American Medical Association

OFFICERS FOR 1908-1909

CHAIRMAN

JOSEPH H. WHITE - - - - - - NEW ORLEANS

VICE-CHAIRMAN

J. N. HURTY - - - - - - - - - INDIANAPOLIS

SECRETARY

S. T. ARMSTRONG - - - - - - - NEW YORK

EXECUTIVE COMMITTEE

DENSLOW LEWIS, CHICAGO.

PRINCE A. MORROW, NEW YORK.

WILLIAM C. GORGAS, ANCON, C. Z.

OFFICERS FOR 1909-1910

CHAIRMAN

J. N. HURTY - - - - - - - - - INDIANAPOLIS

VICE-CHAIRMAN

C. F. WILLIAMS - - - - - - COLUMBIA, S. C.

SECRETARY

M. LANGTON PRICE - - - - - - - BALTIMORE

EXECUTIVE COMMITTEE

PRINCE A. MORROW, NEW YORK.

WILLIAM C. GORGAS, ANCON, C. Z.

J. H. WHITE, NEW ORLEANS.

LIST OF OFFICERS

Those named below have served as officers in this section. This branch of the practice of medicine has been included with other subjects in the earlier years as will be seen by the headings which denote the different names the section has had. The names of the officers have been taken from the published records which are deficient in some cases. It will be appreciated if any additional data are brought to the attention of the General Secretary of the American Medical Association.

SECTION ON MEDICAL JURISPRUDENCE AND HYGIENE

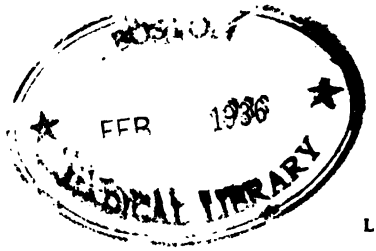
1865 Chairman, Dr. J. F. Hibberd, Richmond, Ind.
Secretary, Dr. Robert Burns, Philadelphia.
1866 Chairman, W. Jewell, Philadelphia.
Secretary, A. N. Bell, New York City.
1867 Record wanting.
1868 Record wanting.
1869 Chairman, J. F. Hibberd, Richmond, Ind.
Secretary, J. K. Bartlett, Milwaukee, Wis.
1870 Chairman, F. H. Getchell, Philadelphia.
Secretary, Benjamin Blackford, Lynchburg, Va.
1871 Record wanting.
1872 Chairman, S. C. Busey, Washington, D. C.
Secretary, S. L. Howard, Maryland.

SECTION ON STATE MEDICINE AND PUBLIC HYGIENE

1873 Chairman, A. N. Bell, New York City.
Secretary, A. B. Stuart, Winona, Minn.
1874 Chairman, H. I. Bowditch, Boston.
Secretary, H. B. Baker, Lansing, Mich.
1875 Chairman, R. C. Kedzie, Lansing, Mich.
Secretary, E. M. Hunt, New York.
1876 Chairman, E. M. Hunt, New York.
Secretary, D. R. Wallace, Terrell, Tex.
1877 Chairman, J. L. Cabell, Virginia.
Secretary, J. T. Reeve, Appleton, Wis.
1878 Chairman, J. S. Billings.
Secretary, J. T. Reeve, Appleton, Wis.

SECTION ON STATE MEDICINE, PUBLIC HYGIENE, CHEMISTRY AND PSYCHOLOGY

1879 Chairman, J. F. Hibberd, Richmond, Ind.
Secretary, J. E. Wood, Elizabeth City, N. C.
1880 Chairman, J. T. Reeve, Appleton, Wis.
Secretary, R. G. Jennings, Little Rock, Ark.
1881 Chairman, A. L. Gibson, U. S. Navy.
Secretary, J. H. Sears, Waco, Tex.
1882 Chairman, Foster Pratt, Kalamazoo, Mich.
Secretary, Thomas L. Neal, Dayton, Ohio.
1883 Chairman, D. J. Roberts, Nashville, Tenn.
Secretary, C. W. Franzoni, Washington, D. C.
1884 Chairman, E. W. Schauffler, Kansas City, Mo.
Secretary, J. N. McCormack, Bowling Green, Ky.
1885 Chairman, J. H. Rauch, Springfield, Ill.
Secretary, F. E. Daniel, Austin, Tex.



LIST OF OFFICERS—Continued

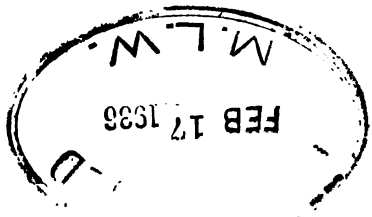
1886 Chairman, G. H. Rohe, Baltimore.
Secretary, W. Wyman, Washington, D. C.
1887 Chairman, H. B. Baker, Lansing, Mich.
Secretary, S. T. Armstrong, Tennessee.
1888 Chairman, J. B. Lindsley, Nashville, Tenn.
Secretary, S. T. Armstrong, Washington, D. C.
1889 Chairman, J. B. Hamilton, Washington, D. C.
Secretary, F. S., Bascom, Salt Lake City.
1890 Chairman, J. D. Plunkett, Nashville, Tenn.
Secretary, F. S. Bascom, Salt Lake City.
1891 Chairman, Benjamin Lee, Philadelphia.
Secretary, L. F. Flick, Philadelphia.
1892 Chairman, C. A. Lindsley, New Haven, Conn.
Secretary, S. P. Duffield, Detroit.
1893 Chairman, G. W. Stoner, Washington, D. C.
Secretary, C. H. Shepherd, Brooklyn.
1894 Chairman, L. H. Montgomery, Chicago.
Secretary, C. H. Shepherd, Brooklyn.
1895 Chairman, C. H. Shepherd, Brooklyn.
Secretary, Elmer Lee, Chicago.
1896 Chairman, Elmer Lee, Chicago.
Secretary, L. F. Bishop, New York City.
1897 Chairman, J. N. Quimby, Jersey City, N. J.
Secretary, A. R. Reynolds, Chicago.
1898 Chairman, A. R. Reynolds, Chicago.
Secretary, W. P. Munn, Denver.
1899 Chairman, W. C. Woodward, Washington, D. C.
Secretary, Amand Ravold, St. Louis.

SECTION ON HYGIENE AND SANITARY SCIENCE

1900 Chairman, Ernest Wende, Buffalo.
Secretary, J. N. Hurty, Indianapolis.
1901 Chairman, A. R. Reynolds, Chicago.
Secretary, H. M. Bracken, Minneapolis.
Delegates, S. G. Bonney, Denver; N. S. Davis, Jr., Chicago.
1902 Chairman, H. M. Bracken, Minneapolis.
Secretary, G. T. Swarts, Providence, R. I.
Delegate, N. S. Davis, Jr., Chicago.
1903 Chairman, G. T. Swartz, Providence, R. I.
Secretary, J. S. Fulton, Baltimore.
Delegate, J. N. Hurty, Indianapolis.
1904 Chairman, J. S. Fulton, Baltimore.
Secretary, M. L. Price, Baltimore.
Delegate, Henry Mitchell.
1905 Chairman, Denslow Lewis, Chicago.
Secretary, Elmer E. Heg, Seattle.
Delegate, H. W. Dewey, Tacoma.
1906 Chairman, Price A. Morrow, New York City.
Secretary, Elmer E. Heg, Seattle.
Delegate, Denslow Lewis, Chicago.
1907 Chairman, William C. Gorgas, Ancon, Canal Zone.
Secretary, S. T. Armstrong, New York City.
Delegate, N. K. Foster, Sacramento.
1908 Chairman, Joseph H. White, New Orleans.
Secretary, S. T. Armstrong, New York City.
Delegate, Clarence L. Wheaton, Chicago.

SECTION ON PREVENTIVE MEDICINE AND PUBLIC HEALTH

1909 Chairman, J. N. Hurty, Indianapolis.
Secretary, M. L. Price, Baltimore.
Delegate, J. H. White, New Orleans.



CONTENTS

PAGE

Chairman's Address: The Scope of Preventive Medicine. J. H. White 9
Preservatives in Food Materials: Their Detection and Effect. D. H. Bergey 15
The Limitations in Public Health Administration. Henry Bixby Hemenway 24
Lake Michigan Water for Drinking Purposes. W. A. Evans 39
The Economic Value of Protecting the Water-Supplies. Harold B. Wood 48
The Prevalence of Rabies in the United States. John W. Kerr and A. M. Stimson 66
The French Government Tobacco Factory at Issy, Near Paris: Hygienic Notes. Francis Dowling 85
A New Type of Phthisiophobia. S. Adolphus Knopf..... 93
Insect Carriers of Typhoid Fever. W. Forest Dutton.... 99
Typhoid Immunity and Antityphoid Inoculation. Willard J. Stone 117
Epidemiologic Studies of Typhoid Fever. L. L. Lumsden. 133
Prevention of Malaria. Seale Harris 159
The Relationship of the Medical Profession to Preventive Medicine. H. M. Bracken 178
Vasectomy as a Means of Preventing Procreation in Defectives. Harry C. Sharp 186
The Notification to the Health Authorities of Cases of Abortion and Miscarriage. Myer Solis-Cohen..... 203
Popular Education as a Stimulus in Public Health Work. W. M. Brumby 212
Proceedings of the Session..... 217

FEB 17 1936

THE SCOPE OF PREVENTIVE MEDICINE

CHAIRMAN'S ADDRESS BEFORE THE SECTION ON PREVENTIVE MEDICINE AND PUBLIC HEALTH OF THE AMERICAN MEDICAL ASSOCIATION, ATLANTIC CITY, 1909.

J. H. WHITE, M.D.
Surgeon United States Public Health and Marine-Hospital Service
NEW ORLEANS

There is—there can be—no higher specialty in medicine than that for which this Section stands, and we must present this to the public in such unmistakable terms that full recognition shall be accorded both to the sanitarian and to the profession as a whole, for neither can stand alone, as I hope presently to show. It is sheer waste of ability and time for the members of this Section to tell each other what they already know, and even the general distribution of new matter by the pioneers of the Section can not, in the nature of things, be so broadly useful as the same character of work would be, and is, in our truly great medical Section. Our greatest function, it seems to me, lies in the fact that we are the connecting link between that great medical body which handles the vast majority of the diseases we would prevent and the general public, the victim of those diseases.

This being an undisputed fact, we should have in mind constantly the two duties which follow this fact as naturally as the day follows the night. We must impress on the public the vast import to them of preventive medicine; we must show them that health means wealth and happiness, to the first very frequently and to the last always a necessary adjuvant.

In last year's Address on Medicine Dr. Thayer very properly said that but for sanitation there could be no Panama Canal; and is it not equally a fact that but for the incessant labor of men poorly paid, or paid not at all, every aggregation of people calling itself a city, even in the temperate zone, would be a focus of endemic disease, and cities of a million inhabitants unspeakable pest-holes, while such as New York, London, Paris, Berlin could not exist?

So much for the value to mankind of our work. These facts are reasons strong enough to justify us, and we shall continue to push forward, always seeking better results, whether recognized or not, content to serve our people as best we may, leaving our reward to their own sense of justice—and oh, the pity of it!—to be so often rewarded by abuse.

We should, for the better advancement of our work, make every possible effort to place the utilitarian aspect of that work before our law-makers and insist that they at least appropriate as much for the protection of their wives and little ones as for that of their swine, cattle and poultry. They might justly have claimed in the past that we had not shown ability to protect them, but this can not be said now.

It is something more than accident that last year Burrell and Thayer in the general orations and Drs. Edsall, Evans, Hurty and others advocated a campaign of education of our people. Such coincidence of thought means that we are ourselves awake and shall awaken our people to their duty to themselves and shall make it plain to them that no man has a right so to keep his house or so to live his life in a civilized community as to jeopardize his neighbor's health or happiness. It means that *we* shall teach all our people that the duty of keeping clean in a physical sense is as high as that of moral cleanliness and a prerequisite to a justified claim of "civis Americanus sum."

The practitioner of medicine saves lives one at a time, and right noble is his calling. You save lives by thousands. Is it not infinitely wiser to prevent the pollution by sewage of a stream supplying a city of a million than to fight that pollution in the bodies of 10,000 innocent victims of filth, or even to attempt the repurification of 100,000,000 gallons of that filth-laden water every day? Is it not better far to prevent the pollution of our food, houses, vehicles and streets by tuberculosis than to spend millions on treatment and then see our loved ones die by tens of thousands?

Is it not cheaper to spend a hundred millions of dollars and rid our country of every anopheles and stegomyia than to see business wither at flood-tide under the blighting grip of yellow fever, and our kindred and friends perish from the pest, while malaria takes its yearly tribute of thousands of lives in our country and destroys earning power to the extent of probably $50,000,000 annually and perhaps double that?

Shall we not vaccinate all our people at a cost of 25 cents each rather than leave some hundreds to die annually and some other hundreds of thousands to be branded with scars, a living shame to the community?

All these things we must bring forcibly and clearly before our people, and to do this we must cultivate our relations with the family physicians. They are closer to the people than we can ever be, and if we arouse their activities we will assure our ends. We must keep in close touch with them, and, indeed, we should enlist as many of them in this Section as possible, because without their help we can do nothing, and without the presence of some of their brightest and best, which, I am thankful to say, we have, at these meetings, we can not keep in as intimate association with them as we must. Fortunately, many of these able men are directly interested in sanitary science and are part and parcel of this Section, thus giving us the very opportunity we seek and should gratefully embrace to

further arouse their interest to create an epidemic of sanitary enthusiasm on their part.

We must enlist the interest of our brethren, the pediatrists and the internists and get them to see and know the pitfalls in the path of the women and children under their care. We must lead them to take enough interest to play the part which a good old gentleman of the old school contemptuously called "dry nurse to the family."

We must start with the little ones, and, after seeing that their mothers are instructed in the hygiene of food and clothing, remove the notion that the children must of necessity have measles, whooping-cough, etc., and the sooner the better, by showing them that these diseases are ideal foundations on which to build future woe in the shape of tuberculosis.

We must teach parents that the sanest weapon with which to fight tuberculosis in their offspring is a good, sound body in which every atom of resisting power is developed by robust health to its maximum efficiency, that the development of the child's physical well-being is as sacred a duty as the development of its mind or morals, and is indeed the only proper foundation for intellectual vigor; that the boy whom they fain would bring up to be the grand man of the future must have sound lungs, stomach, eyes, teeth, etc., and good muscular development to enable him to meet his competitors on equal terms; that only in a healthy child can they realize all their hopes.

We must follow this teaching throughout, enlisting the aid of all branches of the profession, encouraging with all our might the tendency toward supervision of eyes and mouth of public school children, and every other similar movement; holding up the hands of men like Evans, who would not be content with mortality statistics in tuberculosis, but wants to find the morbidity as well, in order that medicine may work its rightful end and heal the sick. Finally, there is another and a

high duty before us—the duty of doing what we can toward bettering health administration all over the country.

The time has passed, if it ever existed, when by virtue solely of the degree of M.D. a man is fitted to assume the duties and vast responsibilities of health officer. Although unfortunate, it is too true that even with special education we can not be sure of the innate ability to apply the knowledge held. We can, at least, be sure that we are not doing anything so utterly absurd as we have been doing under the old system of appointment, with merit only as an accidental qualification.

It is undeniable that some of these round pegs in square holes have adjusted themselves to these important positions and have proved brilliant successes, but these cases are exceptional and only go as parallels to the fact that a brilliant soldier like Napoleon can occasionally be a brilliant law-giver, not at all indicating that any son of Mars can also rival Lycurgus.

Existing health bodies, national, state and municipal, must be upheld until they can be improved—mark you, not replaced, but improved. We are not and never will be successful radicals and the whole tendency of our people for two thousand years has been, not toward elimination and substitution, but toward amendment, first, last and always.

To this conservative trait we owe the stability of northern European and American governments and the vast sense of security resident in the breast of every citizen of these governments. Fifteen hundred years intervene between the Saxon *gau* and the New England town, and yet they are the same in all essentials. The villager has simply improved his individual status and the primal idea of all having a hand in the government remains the same.

Very slight, indeed, are the formal differences between the ideal health organizations and the existing

bodies. A little change in the manner of making appointments; a little better training of personnel; a little fuller understanding by the public of what we seek; a little more care in filling the posts of gradually receding incompetents with well-drilled men, and the end is attained without friction or ill-feeling.

This way, as I see it, lies our destiny. Shall we follow it? Shall we make preventive medicine a very real power in the profession? Or shall we be content to consider it a side issue?

PRESERVATIVES IN FOOD MATERIALS

THEIR DETECTION AND EFFECT

D. H. BERGEY, M.D.
Assistant Professor of Bacteriology, University of Pennsylvania
PHILADELPHIA

The use of preservatives in food materials has engaged the attention of sanitarians for a number of years and they have uniformly condemned the practice. Nevertheless new and hitherto unsuspected uses of preservatives are discovered from time to time notwithstanding the laws prohibiting their use.

The plea of the manufacturers is that the use of preservatives is absolutely necessary to keep the food materials, and also that it is not harmful.

During the past ten years nearly all of the states of the union have enacted laws which aim to prohibit the use of food preservatives. The national law of 1906 has served as a model for many of the state laws enacted since that time.

The Food and Drugs Act, passed by Congress and approved June 30, 1906, provides "for preventing the manufacture, sale, or transportation of adulterated or misbranded or poisonous or deleterious foods, drugs, medicines, and liquors, and for regulating traffic therein, and for other purposes."

Section 7 of the act states that a food shall be deemed to be adulterated:

First: If any substance has been mixed and packed with it so as to reduce or lower or injuriously affect its quality or strength.

Second: If any substance has been substituted wholly or in part for the article.

Third: If any valuable constituent of the article has been wholly or in part abstracted.

Fourth: If it is mixed, colored, powdered, coated, or stained in a manner whereby damage or inferiority is concealed.

Fifth: If it contain any added poisonous or other added deleterious ingredient which may render such article injurious to health: *Provided*, That when in the preparation of food products for shipment they are preserved by an external application applied in such a manner that the preservative is necessarily removed mechanically, or by maceration in water, or otherwise, and directions for the removal of said preservative shall be printed on the covering or the package, the provisions of this act shall be construed as applying only when said products are ready for consumption.

Sixth: If it consists in whole or in part of a filthy, decomposed, or putrid animal or vegetable substance, or any portion of an animal unfit for food, whether manufactured or not, or if it is the product of a diseased animal, or one that has died otherwise than by slaughter.

Regulation 12 explains the terms "coloring," "powdering," "coating," and "staining" as used in Section 7:

(a) Only harmless colors may be used in food products.

(b) The reduction of a substance to a powder to conceal inferiority in character is prohibited.

(c) The term "powdered" means the application of any powdered substance to the exterior portion of articles of food, or the reduction of a substance to a powder.

(d) The term "coated" means the application of any substance to the exterior portion of a food product.

(e) The term "stain" includes any change produced by the addition of any substance to the exterior portion of foods which in any way alters their natural tint.

Regulation 14 relates to the external application of preservatives:

(a) Poisonous or deleterious preservatives shall only be applied externally, and they and the food products shall be of a character which shall not permit the permeation of any of the preservative to the interior, or any portion of the interior, of the product.

(b) When these products are ready for consumption, if any portion of the added preservative shall have penetrated the food product, then the proviso of Section 7, paragraph 5, under "Foods," shall not obtain, and such food products shall then be subject to the regulations for food products in general.

(c) The preservatives applied must be of such a character that, until removed, the food products are inedible.

Regulation 15 relates to the wholesomeness of colors and preservatives:

(a) Respecting the wholesomeness of colors, preservatives, and other substances which are added to foods, the Secretary of Agriculture shall determine from chemical or other examination, under the authority of the agricultural appropriation act (Public 382, approved June 30, 1906), the names of those substances permitted or inhibited in food products; and such findings, when approved by the Secretary of the Treasury and the Secretary of Commerce and Labor, shall become a part of these regulations.

(b) The Secretary of Agriculture shall determine from time to time, in accordance with the authority conferred by the agricultural appropriation act (Public 382, approved June 30, 1906), the principles which shall guide the use of colors, preservatives, and other substances added to foods; and when concurred in by the Secretary of the Treasury and the Secretary of Commerce and Labor, the principles so established shall become a part of these regulations.

Food Inspection Decision 100, approved by Secretary Wilson Dec. 9, 1908, states:

In view of the extent of the bleaching process (flour bleached with nitrogen peroxid) and of the immense quantity of bleached flour now on hand or in process of manufacture, no prosecutions will be recommended by this Department for the manufacture and sale thereof in the District of Columbia or the territories or for transportation or sale in interstate or foreign commerce, for a period of six months from the date thereof.

Food Inspection Decision 101, approved by Secretary Wilson Dec. 18, 1908, states:

Benzoate of soda, in quantities not exceeding one-tenth of 1 per cent., may be added to those foods in which generally heretofore it has been used. The addition of benzoate of soda shall be plainly stated on the label of each package of such food.

Food Inspection Decision 102, dated Dec. 23, 1908, states:

Until further notice, vegetables greened with copper and which are otherwise suitable for food, will be allowed entry into the United States, if the label bears the statement that sulphate of copper or other copper salts have been used to color the vegetables.

The "pure food" laws of the following states conform in all important particulars to the national laws: Vermont, 1908; Massachusetts, 1908; Connecticut, 1907; New Jersey, 1908; Pennsylvania, 1909; Delaware, 1907; Virginia, 1908; West Virginia, 1907; North Carolina, 1907; Georgia, 1906; Kentucky, 1908; Tennessee, 1907; Illinois, 1907; Arkansas, Colorado, 1907; Texas, 1909; Oklahoma, 1909.

Food Inspection Decision 101 permits the use of one-tenth of one per cent. of sodium benzoate in "those foods in which generally heretofore it has been used." This provision is apparently so drawn as to make it permissible to use sodium benzoate in almost any food substance. Some of the states which permit the use of sodium benzoate restrict its use to certain substances, as catsup, etc., while others have even less definite restrictions than those of the United States law.

Aside from the food regulations of the United States, the laws of the following states permit the use of sodium benzoate in food: Maine, New Hampshire, Pennsylvania, North Carolina, Georgia, Iowa, Texas, North Dakota, South Dakota, Wyoming, Oregon, and Washington. In the laws of the other states sodium benzoate is not expressly mentioned, but the laws of most of the states appear to prohibit its use.

The use of benzoate of soda, permitted by Decision 101, is, to my view, an unmitigated evil since we have the assurance of many manufacturers that such use is absolutely unnecessary to preserve the food materials in which it is used.

Dr. H. W. Wiley, chief of the Bureau of Chemistry, United States Department of Agriculture, in Circular 39 of that department, gives the results of experiments and the general conclusions drawn from them as to the injurious effects of sodium benzoate, as follows:

> From a careful study of the data in the individual cases and of the summaries of the results, it is evident that the administration of benzoic acid, either as such or in the form

of benzoate of soda, is highly objectionable and produces a very serious disturbance of the metabolic functions, attended with injury to digestion and health.

As in the case of boric acid, salicylic acid, and sulphurous acid, this injury manifests itself in a number of different ways, both in the production of unfavorable symptoms and in the disturbance of metabolism. These injurious effects are evident in the medical and clinical data, which show great disturbances of digestion, attended by phenomena which are clearly indicative of irritation, nausea, headache, and, in a few cases, vomiting. These symptoms were not only well marked, but they were produced on healthy individuals, receiving good and nourishing food and living under proper sanitary conditions. It is not only fair to conclude, therefore, that under similar conditions of administration of benzoic acid or benzoate of soda in the case of weaker systems, or less resistant conditions of health, much more serious and lasting injury would be produced.

It was also noticed that the administration of benzoic acid and benzoate of soda was attended with a distinct loss of weight, indicative of either a disturbance of assimilation or an increased activity in those processes of the body which result in destruction of tissue. The production of a loss of weight in cases of this kind must be regarded as indicative of injurious effects.

The influence of the benzoic acid and benzoate of soda on metabolism was never of a character indicative of a favorable change therein. While often the metabolic changes were not strongly marked, such changes as were established were of an injurious nature. It is evident that the administration of these bodies, therefore, in the food tends to derange metabolism in an injurious way.

An important fact in connection with the administration of these bodies is found in the efforts which Nature makes to eliminate them from the system. In so far as possible the benzoic acid is converted into hippuric acid. There is a tendency usually manifested, however, to retain the benzoic acid in tne body for a notable length of time, and this is much more marked in the case of benzoate of soda than in the case of benzoic acid.

While the administration of both of these bodies, therefore, is undoubtedly harmful, the injurious effects are pronounced more rapidly in the case of benzoic acid than they are in the case of benzoate of soda; the data, however, will show that the total harmful effect produced in the end is practically the same in both cases; hence there appears to be no reason for supposing that the administration of the pre-

servative in the form of benzoate of soda can be justified by an argument relating to the less injurious effect thereof on health.

The occurrence of microscopic bodies in the urine is undoubtedly increased under the administration of benzoic acid in both forms, thus showing conclusively the tendency to stimulate the destructive activities of the body.

Coming to final consideration of all of these different phases of the subject, there is only one conclusion to be drawn from the data which have been presented, and that is that in the interests of health both benzoic acid and benzoate of soda should be excluded from food products. This conclusion is reached independently of any consideration of the conditions which it is alleged surround the processes of manufacture and which result in the demands of the manufacturers to be allowed to continue the use of these substances. This is a subject which must be discussed from an entirely different point of view and has no bearing whatever on the general conclusions which have been reached, namely, that both benzoic acid and benzoate of soda are bodies which, when added to foods, are injurious to health.

In view of the fact that benzoic acid and sodium benzoate are allowed by the national and state laws, I hoped to perfect a speedy and simple method of discovering these substances in food substances.

ANTIFERMENTATIVE TEST FOR THE PRESENCE OF PRESERVATIVES IN FOOD MATERIALS

I have made a large series of tests to ascertain with what degree of certainty the presence of preservatives may be detected in food by means of the antifermentative action of the preservatives on trypsin. The studies of Bliss and Novy[1] show that of the ordinary digestive ferments trypsin is injured to the greatest extent by formaldehyd, aside from the effect of the preservative on the food constituents themselves. These results are confirmed by those of Sheperd,[2] who found that nitrous acid affected pancreatic digestion in higher dilution than it did the other ferments which he em-

1 Bliss and Novy: Jour. Exper. Med., 1899, iv, 47.
2. Sheperd: Report of Food and Dairy Commissioner, North Dakota, 1908.

ployed. For these reasons I regarded trypsin as a delicate indication of the presence of preservatives in food.

The tests for the detection of preservatives in food were carried out by the addition of small amounts of the food to a definite volume of a sterile solution of casein and determining the inhibiting influence of the preserved food on the tryptic digestion of the casein by the addition of a few drops of an alcoholic solution of acetic acid to the mixture at the end of a period of digestive action.

The following experiments may be cited as indicative of the results obtained in a large series of tests:

TABLE OF RESULTS

Thirteen test-tubes containing 2 c.c. casein solution and 0.5 c.c. trypsin solution, to which increasing quantities of milk serum were added and decreasing quantities of 0.85 per cent sodium chlorid solution. These tubes were incubated at 37.0 degrees C. for three-quarters of an hour, when the alcoholic acetic acid was added drop by drop, about six drops of the acetic acid to each tube:

Milk Serum.	NaCl.	Sodium Benzoate.	Sodium Sulphite.	Results.
0.0 c.c.	1.0 c.c.	.....	.....	Nearly complete digestion
0.1 c.c.	0.9 c.c.	.....	.....	Nearly complete digestion
0.2 c.c.	0.8 c.c.	.....	.....	Nearly complete digestion
0.3 c.c.	0.7 c.c.	.....	.....	Nearly complete digestion
0.4 c.c.	0.6 c.c.	.....	.....	Slight precipitate formed
0.5 c.c.	0.5 c.c.	.....	.....	Slight precipitate formed
0.6 c.c.	0.4 c.c.	.....	.....	Definite precipitate formed
0.7 c.c.	0.3 c.c.	.....	.....	Definite precipitate formed
0.8 c.c.	0.2 c.c.	.....	.....	Definite precipitate formed
0.9 c.c.	0.1 c.c.	.....	.....	Definite precipitate formed
1.0 c.c.	0.0 c.c.	.....	.....	Marked precipitate formed
0.0 c.c.	0.5 c.c.	0.5 c.c.	.....	Definite precipitate formed
0.0 c.c.	0.5 c.c.	.....	0.5 c.c.	Slight precipitate formed

Increasing quantities of milk serum exerted an ascending effect in inhibiting the tryptic digestion of the casein, indicating that some preservative had been added to the milk. The addition of 0.5 c.c. sodium benzoate solution (concentrated) produced a slightly greater inhibition of the tryptic digestion than did an equal quantity of the milk serum, while 0.5 c.c. sodium sulphite solution (concentrated) produced approximately a degree of inhibition of the tryptic digestion equal to that produced by an equal quantity of the milk serum.

I have also attempted to ascertain the reliability of the antifermentative test in the detection of preservatives in meat. The hacked meat is placed in a meat-press and the blood and juices expressed. The main difficulty in applying the test to the meat juices lies in the fact that normal blood serum exerts an antifermentative effect. I have attempted to overcome this influence by heating the meat juice and recovering the watery part of the juice for the tests. The tests with this final product have not been satisfactory because, apparently, the major portion of the preservatives is retained in the coagulated albumin of the blood serum, and in consequence the tests made on the watery part of the meat juice were never very decisive.

The evidence which scientific investigators have collected all shows that the addition of chemical preservatives to food substances is injurious to the consumer in several different ways:

1. The use of preservatives permits the use of food substances that are of inferior grade or that are not perfectly fresh.

2. The food preservatives when taken into the body must be eliminated subsequently; this operation entails extra labor on some special organ or organs, and this extra labor will sooner or later lead to direct injury.

3. Many of the food preservatives are direct poisons and their constant ingestion induces chronic poisoning with its concomitant effects.

4. The food preservatives have an antifermentative effect on the different digestive ferments, especially on trypsin, and thus retard digestion and interfere with assimilation.

5. The food preservatives act on the food substances in such a manner as to render them less easily digested or even wholly indigestible, and make it necessary for the body to deal with partly digested food or deprive it altogether of nutrition, especially of nitrogenous food.

6. In consequence of the use of food preservatives digestion and assimilation are interfered with, and the

general nutrition of the body suffers through organs that are overtaxed and injured in attempting to eliminate the poisonous chemical substances, and in attempting to deal with imperfectly split food substances that may be in such a state as to preclude their utilization, especially on account of the lack of digestive ferments, because of the loss entailed through the destructive action of the food preservatives.

SUMMARY

Contrary to my expectations the use of the antifermentative test for the detection of preservatives in foods does not give results that are satisfactory in every particular. The employment of this test must be carried out in such a manner as to eliminate normal antifermentative effects in the food substances, and attempts to remove these normal antiferments may lead to the simultaneous removal of the preservative.

In view of our knowledge of the detrimental effects of chemical food preservatives there is no more reprehensible practice than that of permitting their use in foods in any quantity whatever. The better class of manufacturers and dealers have set us an example, which we should follow, in the fight which they are making against the enactment of laws that in any particular permit the use of chemical substances for the preservation of foods where their use is not absolutely necessary.

We should not allow the greed of unscrupulous manufacturers and dealers to overrule our knowledge of the evil effects of the use of food preservatives. The medical profession owes it to itself to uphold the laudable position assumed by Dr. Wiley in his crusade against food adulteration, and any course which falls short of this will stultify the profession in the eyes of educated humanity of to-day and for all time to come.

206 South Fifty-third Street.

THE LIMITATIONS IN PUBLIC HEALTH ADMINISTRATION

HENRY BIXBY HEMENWAY, A.M., M.D.
EVANSTON, ILL.

A potent cause of unsatisfactory results in public health work is found in the vague ideas often entertained among officials, private physicians and the people generally, relative to the powers and duties of health departments. There is often a clearer perception of the object to be attained than of the means to that end. Very few physicians have more than a hazy notion of the science of sanitation. Education in this line is emphatically lacking, and the importance of the subject is little recognized. The Council on Medical Education of the American Medical Association recommended that out of a course of 4,100 hours only 120, or less than 3 per cent., should be divided between this great subject and medical economics and medical jurisprudence. Considering the fact that this council speaks for the leading American medical schools, it is not strange that we find great ignorance among our professional brethren as to the objects to be sought, and the steps to be taken, in sanitation.

There is inherent in the Anglo-Saxon mind a love of liberty; but liberty is not license. Professor Burgess, in his "Comparative Constitutional Law," sets forth clearly and at some length the fact that true liberty is only found under a constitutional government, and that for this purpose government exists. Thus, in the fourteenth amendment to the Constitution of the United States, we find the provision that no state shall "de-

prive any person of life, liberty or property, without due process of law." Under military law this provision may be laid aside. Sometimes it is true that for sanitary reasons, as in the presence of a pestilence, it may be necessary to declare martial law, but such a process must be reserved for extreme necessity. It is repugnant to all our institutions. Arbitrary or autocratic methods in health administration arouse an opposition which defeats the object sought. The health official is not a despot, but a servant, whose duty it is to preserve the health of the community in conformity with the laws which have been properly enacted.

In the United States the national government has only such powers as were conferred on it by the people of the several states. Essentially the state is supreme, and there are reserved to it by the tenth amendment to the Constitution all those powers not given to the nation or prohibited by the Constitution to the state. The only authority of a sanitary nature which the nation has must be found in the regulation of commerce. We frequently hear the suggestion that the national government ought to pass a law regulating the practice of medicine, for example, so that the requirements might be uniform in all parts of the land; and to make transfers from state to state less troublesome. Though such a law might be desirable, as a practical fact it is at present impossible, for the simple reason that Congress has no power to pass such an act.

A similar problem is found in the preservation of interstate rivers and lakes from pollution. The people might, especially in the presence of an epidemic, permit the government to step in actively to purify a river, but its legal power might be very questionable. This power must rest somewhere; if not in the national government then it remains with the state. Through its power to regulate commerce the government has a degree of authority over navigable waters. It is, therefore, constantly spending large sums for the deepening of rivers

and harbors. This leads to another practical problem of power and limitations. An act for the deepening of rivers usually provides that it be done by contract at the least possible expense to the government. The contractors who have been dredging the Chicago River have been dumping the slime and filth from the bottom of the river into the lake, and the water-supply of the city has been thereby threatened with contamination. The War Department, which has charge of the dredging, can not order the dredgings taken further into the lake, for that would increase the cost of the work. No national statute is violated by dumping near the cribs. Neither has the national government the power to pass such a law. It may, however, have inserted into the appropriation bill a provision governing such contracts, so that the contractor may be paid for the extra transportation, and under such conditions dumping near a crib might be a violation of contract.

There is another way by which this object may be gained. By the acts creating the Territory of Illinois and the State of Illinois, and by the constitutions of the state, the eastern boundary of the northern part of the state is the middle of Lake Michigan. By the law of the state (Chapter 34, Section 3) also, the jurisdiction of Cook and Lake counties extends to the midle of the lake, whereas (Chapter 24, Section 71) the jurisdiction of a city like Chicago extends over the waters of the lake only three miles beyond the limits of the city. Although Section 256 of Chapter 24 of the Revised Statutes of Illinois provides that: "The jurisdiction of such city, town or village to prevent or punish any pollution or injury to the stream or source of water for the supply of such water works shall extend ten miles beyond the corporate limits," we have the opinion of Attorney-General John W. Griggs to the following effect: "While an ordinance of the city of Chicago may, as to all persons subject to its jurisdiction, forbid the deposit of any heavy substance in the waters of

Lake Michigan within eight miles of the shore in front of that city, it can not control or limit the power of Congress over the navigable waters of the United States, nor dictate where it shall or where it shall not deposit, within such waters, material removed in the improvement of one of its harbors." It will be noticed that Mr. Griggs' opinion is relative to the power of a city, not of a state. The power of the state is not there discussed. It is quite true, as Mr. Griggs states, that the proper "remedy is by appeal to the good sense, discretion, and fairness of the Secretary" (of War), for pacific measures may often attain the desired result more quickly than by a resort to force. As a basis of appeal, however, the law of the state should be more potent than that of the city, and in the light of such cases as Wilson vs. Blackbird Creek Company (2 Peters, 245) it would seem that in case of necessity action by the state might prevail in the courts, even against the national powers.

The Blackbird Creek Company, being so authorized by the State of Delaware, constructed a dam by which the navigation of the stream was interrupted. The primary object was to reclaim a marsh, thus increasing the value of the property, and to improve the health of the inhabitants. Wilson was the owner of a sloop, licensed and enrolled under United States statutes. He injured the dam, and, being sued by the company, he denied the right of the state thus to interfere with commerce. Chief Justice Marshall delivered the opinion sustaining the power of the state, although it "stops a navigable creek and must be supposed to abridge the rights of those who have been accustomed to use it." In Gilman vs. Philadelphia (3 Wallace's Rep., 713) the opinion of Mr. Justice Clifford, Wayne and Davis concurring, refers approvingly to the Blackbird Creek case, saying that it "treated the erection of the dam as one adapted to reclaim the adjacent marshes and as essential to the public health, and sustained the constitu-

tionality of the law authorizing the erection, on the ground that was within the reserved police powers of the state." This expression is the more significant for the reason that this dissenting minority held that the Blackbird Creek case did not apply in the Philadelphia bridge case, because there was no question of sanitation involved in the erection of a bridge across the Schuylkill river. The majority of the court had upheld the powers of the state to erect such a bridge, basing their action on the Blackbird Creek decision.

When two constructions of a statute are possible, one of which is constitutional and the other not, we are bound to choose that which is. An act of Congress which refers to a regulation of commerce may be construed in harmony with the sanitary powers of the state; or, in line with the opinion of Mr. Griggs, above mentioned, as against, and superior to such sanitary control by the state. In the latter case Congress would in reality assume jurisdiction over sanitary matters which it does not possess. Such a construction would make the act unconstitutional, on the ground that Congress had exceeded its authority. We are forced, therefore, to reject a construction which makes the power to regulate commerce necessarily paramount to state sanitary statutes, and to accept the view that the state still has sanitary jurisdiction over the officers and agents of the national government.

Neither county nor state may do anything which would interfere with navigation without the consent of the War Department, but it is their manifest duty to protect their citizens by passing and enforcing suitable laws for the preservation of the purity of the water-supply, and such laws the nation is bound to respect.

So far as the decisions of the ultimate tribunal on constitutional interpretation now stand, the following propositions seem to be established: (1) The several states have power to pass laws regulating the internal police of their own territories, which territories include navigable rivers and harbors, as well as unnavigable streams, and the land itself. These

police measures . . . are simply a part of the general system by which each state endeavors to protect the good morals, lives, health, persons and property of its inhabitants.[1]

It is generally admitted that quarantine regulations are controlled by the states. I have found no case to the contrary. As Pomeroy says:[1]

This entire class of statutes establishing police regulations is within the purview of state legislation, whether Congress has legislated for the same or similar purposes or not. Among them may be mentioned laws establishing quarantine, licensing and controlling pilots. . . .

In the case of Gibbons vs. Ogden (9 Wheaton's Rep., 203) Chief Justice Marshall says of inspection laws:

They form a portion of that immense mass of legislation which embraces everything within the territory of a state not surrendered to the general government; all which can be most advantageously exercised by the states themselves. Inspection laws, quarantine laws, health laws of every description, . . . are component parts of this mass. No direct general power over these objects is granted to Congress; and, consequently, they remain subject to state legislation.

So in Barbier vs. Connoly (U. S. Reports, 2 Peters, 102) we find the police power of the state to include "to prescribe regulations to promote the health, peace, morals, education and good order of the people."

The authority of the states to pass health laws, as in opposition to the power of Congress to regulate commerce, has been discussed in many cases before the Supreme Court of the United States, and whenever it has appeared that the statutes or regulations have been really in the interest of health the authority of the state has been sustained. Several statutes have been declared unconstitutional on the ground that, though nominally health regulations, they were not so in fact, but they were restrictions of commerce. Such was the ruling in the Railroad Company vs. Husen, 5 Otto, 465, in which the State of Missouri attempted to exclude cattle from certain other states, and in the Passenger cases (7

1. Pomeroy: Constitutional Law, Sect. 329.

How., 283); yet in these the sanitary power of the states was recognized. In the Passenger cases Mr. Justice McLean said: "In giving the commercial power to Congress the states did not part with that power of self-preservation which must be inherent in every organized community" (p. 400). On the other hand, in Smith vs. St. Louis and Southwestern Railway Co., 181 U. S., p. 248, which, like the Husen case, referred to the quarantine of cattle, it was held that "quarantine law as construed and applied in this case is not in conflict with the Constitution of the United States. The prevention of disease is the essence of a quarantine law. Such law is directed not only to the actually diseased, but to what has become exposed to disease." In Morgan's Steamship Co. vs. Louisiana Board of Health, 118 U. S., p. 455, we find:

> The system of quarantine laws is a rightful exercise of the police power for the protection of health which is not forbidden by the Constitution of the United States. While some of the rules of that system may amount to regulations of commerce with foreign nations or among the states, though not so designed, they belong to that class which the states may establish until Congress acts in the matter, by covering the same ground or forbidding the states. Congress, so far from doing either of these things has, by the act of 1799 (Chap. 53 Rev. Stat.) and previous laws, and by the recent act of 1878 (20 stat. 37) adopted the laws of the states on that subject, and forbidden all interference with their enforcement.

In Jacobson vs. Massachusetts (197 U. S., 11) Mr. Justice Harlan says on page 25:

> The authority of the state to enact this statute is to be referred to what is commonly called the police power—a power which the state did not surrender when becoming a member of the union under the Constitution. Although this court has refrained from any attempt to define the limits of that power, yet it has distinctly recognized the authority of a state to enact quarantine laws and health laws of every description, indeed all laws that relate to matters completely within its territory, and which do not by their necessary operation affect the people of other states.

This power was upheld, even though it stopped navigation, as in Leovy vs. United States (177 U. S., p. 621), in which the right to erect a dike was upheld for public health, and in Manigault vs. Springs (199 U. S., p. 473), with reference to a dam on Kinlock Creek, and in *Compagnie Francaise de Navigation à Vapeur* vs. Louisiana State Board of Health (186 U. S., p. 380) a steamship company was forbidden to land its passengers at certain points in the State of Louisiana then under quarantine, although those passengers were not diseased, nor had they been exposed to disease, so far as was shown, and though they had sailed from European ports, in accordance with treaties made between the United States and European nations.

If the sanitary authority rests primarily in the states, does it not necessarily follow that it is the duty of the states to enact and enforce such laws and regulations as shall be best fitted to preserve the lives and health of the citizens? Does not a neglect to do so expose the state to a liability for damages? The object of laws is not the punishment of offenders, but the preservation of the persons and property of the citizens from injury. After an epidemic has despoiled a community, the state can not restore lives lost, or compensate for sickness. The duty of the state is to prevent the epidemic. Methods must change with increase of knowledge. Modern sanitary science is giving many aids for the control of disease far more efficient than the ancient quarantine. Health administrators may rightly be expected to keep informed, and to communicate to legislative bodies the knowledge of these advances, and suggestions for their application. The special responsibilities for each branch of government must be recognized by all.

It must be remembered that the state has no authority to pass any retroactive law, or one which will impair a contract. In the case of dredging contracts already existing which have been based on the right to dump in the vicinity of the cribs, a new law prohibiting such

dumping might be held as an impairment of contract. In the case in question, however, Illinois has a statute in the criminal code (Chapter 38, Section 202) providing that "whoever wilfully and maliciously defiles, corrupts or makes impure any spring, or other source of water, or reservoir . . . or aids and abets in any such trespass, shall be fined not exceeding $1,000, or confined in the county jail not exceeding one year." If that statute applies here, such dumping is illegal, and, therefore, a contract based on a presupposed violation of this statute would not be impaired by making the penalty greater, or more clearly stating the prohibition.

It is proper here to ask the question whether or not the discharge of sewers into the lake is not also a violation of this same statute, providing they are so located as to contaminate the water supply of the city. Probably this question may be answered only by a court decision.

Just as the national government may not enact legislation further than the people of the individual states have granted authority, so cities, towns, villages and counties are restricted to the powers expressly given by the states. The unit is the state, not the city. Still we sometimes hear it stated that the city has complete power to control sanitation within its limits. The specific powers of a city may vary in different states, but the general statement is the same for all. Again, turning to Illinois for an example, we find a clear statement in the case of Jenkins vs. Board of Education. The relator, Louise Jenkins, was refused admission to the John Fiske School in Chicago because she had not been vaccinated, the board of education basing its refusal on an ordinance of the City of Chicago. In its decision the court says: "Not only has the legislature never prescribed vaccination as a condition to the enjoyment of the legal right to attend public schools, but they have never conferred on cities the power to do so," and again in the same decision: "The health commissioner is a

purely ministerial officer and has no legislative powers whatever."

American governmental bodies are based on the triple system, legislative, executive and judicial. These should be distinct. The wording of the different constitutions vary, but the theory is the same in all. That of Illinois, for example, provides that "no person, or collection of persons, being one of these departments, shall exercise any power properly belonging to either of the others."

Health departments are executive in their character, and they should be so restricted in their operations. It is true that in many states a city or village council may be given the duties and authority of a board of health. Such provision is no exception to the general independence of the three branches. The council is legislative whether in or out of the board of health, and the health officer or commissioner is the executive.

Sanitary laws, like those of other nature, should be passed by legislative bodies; state boards of health, so far as I know, have nowhere in this country legislative powers. They may make rules and regulations for carrying into effect the statutes enacted, but such rules have not the standing or the permanence of statutes, and it is a mistake to attempt to depend on such regulations when a statute can be secured. To give uniformity and strength, so far as possible the sanitary statutes should be passed by the state legislature, rather than depend on the enactments of cities. The state statutes should require a certain form of health administration in every city of the state. That makes it possible without delay to communicate with the proper official. An illustration of what is not advisable may be found in the Illinois statutes on this point. There is no provision for compelling the appointment of either a city commissioner of health or board of health, but either are permitted. Neither is there any statement of the qualification for such officials.

If the requirement that contagious diseases should be reported depends on municipal enactment there is immediate confusion. One city requires whooping-cough reported, but not tuberculosis, and there may be a variation also in other requirements. Such laws should be passed by the state, specifically mentioning each disease to be reported, and stating by whom, to whom and when such reports should be made. It is unfortunate that a very large proportion of practitioners do not yet realize that it is as important to report malaria and typhoid fever as it is to restrict smallpox. The determining what diseases should be reported should not be left to the individual judgment of a health officer or to the uncertain ruling of a court. Statistics to be valuable must be on a uniform basis and complete. The personal equation must be eliminated as much as possible.

There is a great difference between a mandate and a request. It is unfair to the practitioner to require him to comply with a rule which he may not easily find. He may be expected to comply with state statutes, but he should not be punished for failure to comply with a ruling of a health officer, or of a court, when such rulings are not easily within his knowledge. On the other hand, for due reason clearly stated, a health officer may request the reporting of a disease not mentioned in the statute, and the request would be generally complied with by the citizens if it were reasonable. Such reports would form a basis for study, and by proving their value the request might pave the way for the statute.

Statutes to be effective must be definite. While it may be necessary sometimes to leave something to the judgment of the executive, the essential requirements must be clearly stated. Suppose the statute simply requires the reporting of "infectious diseases," without mentioning their names. A physician failing to report malaria might deny its infectious character, and legally his opinion is as good as that of the health official. Only a court decision could settle the dispute. On the other

hand, it may be left to the health official to determine to some degree the form of the report. His form may include a statement of water- and milk-supply, school attended and other important data, but unless such data are mentioned in the statute both official and practitioner must recognize that the giving of such information is largely an act of courtesy on the part of the reporter.

Not only is an executive health official denied legislative powers, but he is prohibited from acting in a judicial character. He may, and must, often decide questions of interpretation, but his decision is personal, not official. He may not legally determine what diseases shall be reported. Neither may he judicially decide that any statute is being violated. He may prosecute or begin action, but only a court may give a judicial decision.

According to the statutes of some states, the state board of health also has charge of licensure for medical practice. I am not aware of any judicial decision on this point, but it seems that such a provision is unconstitutional on the ground that boards of health are essentially executive, while the work of license boards is judicial, and entirely foreign to the work of a health department. The license board passes judgment on the standing of a medical school, or the educational and moral qualifications of a candidate, basing its action on the evidence presented. Prosecutions for violations of practice laws might properly be brought by a health department, but when the prosecutions are brought by the same body which issues the license the condition easily gives rise to a suspicion of legalized blackmailing.

One great limitation to all health work is ignorance. Administration can not advance far beyond popular knowledge. The model department of health must be primarily an educator. It must educate itself by making original investigations. Others may equally well make bacteriologic experiments, but health officials have a

peculiar advantage for the collection and analysis of statistics. Since statistics form a very large portion of the foundation of public sanitation, it follows that to be a good statistician is a most important qualification for a health official. Then, too, there are certain problems which attract the attention of the sanitarian, which may totally escape the consideration of others. For example: Though plankton (pelagic flora and fauna, distinguished from coast and bottom forms) has been studied in its relation to fish culture, its sanitary relationship is not as yet known. It is quite likely that some forms may be pathogenetic either directly or by their effect on food fish. On the other hand, potamoplankton especially may prove a most important aid in sewage destruction.

The health department must also educate physicians and the laity to an appreciation of the known facts of sanitation, and to arouse a popular interest in the subject. With such a sympathetic interest it will be much more easy to secure suitable legislation, and to enforce the laws without unnecessary friction. On the other hand, when the legislation is far in advance of the popular education the executive must encounter great opposition in its enforcement. It is the lack of this sympathetic assistance which sometimes causes great annoyance. Frequent cases of a contagious disease occur, without an apparent connecting link, because many of the cases are unreported. A limitation here is caused by the unwillingness of people to submit to quarantine. Perhaps that unwillingness arises from financial necessity. The problem suggested is very largely sociologic, and the question to be answered is, how far the community is justified in establishing quarantine. Has the community a moral right to quarantine a family, unless it provides for the support of the family during the time?

A question as to the rights of an individual who is apparently healthy forms another limitation to the health official. Statutes should be passed giving the

health official a right to make an examination of the person and discharges of a supposed disease-carrier, typhoid or diphtheria, for example, and to restrict the liberty of all such persons, prohibiting them especially from all occupations in which they would handle food materials, as in dairies, bakeries, restaurants, etc.

Sometimes a health official assumes authority which he does not possesss. Sanitary regulations relative to destruction of rats and insects should be based on statutes, but time may be saved sometimes by issuing an order unsupported by the law. It rarely is necessary to declare martial law. In the absence of specific laws it is usually safer to depend on moral suasion than to strain the force of authority. The facts should be clearly stated to the people that the responsibility for conditions and lack of statutory aid may be placed where it properly belongs.

While it is within the province of a health department to treat disease, it is questionable whether or not such treatment should go beyond protection against the spread of the disease. Unnecessary interference with private business arouses an opposition which does much to limit the usefulness of a health department. Physicians hesitate to report cases if they are to be deprived of the care of their patrons.

In a similar manner it is often necessary that the community should furnish free antitoxin for the purpose of restricting disease. If, however, the antitoxin is given free to all, the legitimate business of manufacturers and merchants is stifled. It is difficult to see any more excuse for supplying free antitoxin to all than for supplying clothing or bread for all.

It is not presumed that the foregoing is a complete discussion of the subject, but it is intended rather as a suggestive outline, to call attention to a much-neglected feature of our work. No reference is made to the limitations in school inspection, that great field for preventive medicine which must largely depend on wise

legislation for authority. Neither have we called attention to the physical limitations, dependent on the nature of the soil and its former occupation, or on other conditions largely beyond control. It is a simple matter to construct a rat-proof town, but San Francisco has found it no easy task to exterminate those vermin from old buildings poorly constructed. And there is another great limitation so common as to be well recognized—that of finance. If we have not enough to do all we should like, we are obliged to select that which is most necessary.

1243 Chicago Avenue.

ABSTRACT OF DISCUSSION

DR. J. W. CLEMMER, Columbus, Ohio: This paper treats of fundamental principles in sanitary administration, and nothing could be of more importance in the public health service. At bottom this service rests on legal authority. A public sanitarian should know the legal provisions on which to ground public service. Sanitary authority primarily rests on a grant of the state; this grant may delegate authority to local boards of health to create such rules and regulations which on publication will have the force and effect of city ordinances. The state law may be specific in defining sanitary provisions in all matters of public health interests. In Ohio, large and general powers for sanitary administration are conferred on local boards of health. In turn, these boards create sanitary laws or ordinances for the regulation of the public. In this way the state confers not only police powers, but judicial powers on health boards. The Supreme Court of Ohio has recently confirmed the decisions of the lower courts in a case from Cincinnati in which a sanitary official, in carrying out a regulation of the board of health demanding the confiscation and destruction of milk kept for sale above a certain temperature, arrested and successfully prosecuted a dairyman under this regulation. From this it appears that all the courts of Ohio have confirmed a ruling of the health board in a specific matter of public health regulation. Such powers of administration applicable to other affairs give all the authority desired. The constitutionality of such enactment of the legislature, conferring such powers on appointive bodies, may be questioned, but the fact remains that the results of such a law in Ohio are satisfactory.

LAKE MICHIGAN WATER FOR DRINKING PURPOSES

W. A. EVANS, M.S., M.D.
Health Commissioner of the City of Chicago
CHICAGO

Lake Michigan occupies a hole scooped out by glacial ice. It is not a natural valley, and in consequence the rivers which drain into it are short and discharge very little water. This is true of the south end and the west shore. On the east shore the St. Joseph, Grand, Muskegon and Manistee are fairly long and carry a fair volume of water. The first two of these drain rather populous areas and their waters reach the lake quite polluted. The banks are seldom sloping and the drainage of storm water does not run directly into the lake except for the distance of a few feet back from the water-line. These factors protect the lake against pollution and therefore argue for the use of its waters for drinking. It is a soft, fresh water and cold.

The other side is this: Counting Chicago, 2,000,000 people either live on the shores or so near thereto that their sewage reaches the lake after a short flow. Just now this population is increasing at the rate of 100,000 a year. In no single instance is any of this sewage properly treated before being discharged and in but few instances is it treated at all.

The tonnage of Lake Michigan shipping is very heavy. The ships carry both freight and passengers. The excursion business between Chicago, Milwaukee, St. Joseph, Benton Harbor and Michigan City is very heavy. A single ship will carry from a few hundred

to a few thousand passengers, and the water intakes are usually steering points. Near the water intakes are the points of maximum discharge of feces and urine, as none of these ships have holding devices, or rules as to the closing of closets, and the zones around the intakes are not restricted navigation zones. These waters are more dangerous than salt waters, in that the same water is used for sewage, navigation and drinking purposes. They are less dangerous than ocean waters in that we do not have the shore and wharf pollution action of the tides. The soft waters differ from the salt waters in their action on sewage and different trade wastes. Our fresh water *per se* has no restraining action on the growth of bacteria nor does it modify the chemistry of materials deposited therein.

The Chicago sewage from the south line of Evanston to Eighty-fifth Street on the south now flows into the drainage canal and thence ultimately into the Gulf of Mexico. South of Eighty-fifth Street we now have about 150,000 people whose sewage flows into the Calumet River and then after a short flow into the lake. This sewage is not purified before it is discharged into the river. The same stream also discharges the sewage of Hammond, Ind. (20,000); Whiting, Ind. (10,000); East Chicago and Indiana Harbor (20,000); Gary, Ind. (10,000). On account of the rapid growth of these just-over-the-line sources of contamination, it is safe to say that within five years the polluting popoulation will be 200,000. If we add to that the Calumet Valley population in Illinois, in five years we have 400,000 people. For all of these reasons raw sewage must be kept out of Lake Michigan.

The normal water of Lake Michigan twenty miles from shore contains eight bacteria per c.c. and no colon bacilli. There are no uniform currents in the south end of Lake Michigan. The surface current always flows with the wind. A flow of five to seven miles is not enough to purify a large volume of sewage. The time required

for a flow of this distance is not enough for purification. The oxygen content of the water is not high enough to purify in this length of time. The saprophytic bacteria are less and less active as the medium is diluted with fresh water. Though a sewage stream holds together quite definitely for three to five miles, wave action limits the efficacy of sedimentation. There is not much fauna and still less flora in these waters.

Generally speaking, these soils of the communities just mentioned are underlaid by a deep stratum of strong sulphosaline water unfit for general drinking purposes. The shallower soil strata do not yield water enough to sustain large populations. The streams to the west and south are altogether insufficient for water purposes. The streams on the east shore are highly polluted. There are no mountains or other high places even fairly satisfactory for water reserve purposes. The waters of Lake Michigan must furnish the drinking-water for these large and growing cities. Therefore the waters must be kept pure.

Chicago has had a typhoid death rate of over 175 per 100,000. Last year it fell to 15.5. That was the lowest in the history of the city. The first five months of this year are lower than the corresponding portion of last year or any other year. The typhoid death rate of the other Lake Michigan cities is high—higher than the American average. The Milwaukee average for five years (1904-1908) was 21.9 per 100,000; Michigan City goes to 40; Hammond, Whiting, East Chicago and Gary range around 70, and some years 90 to 140. These are illustrations of averages around the lake. Escanaba, Grand Rapids, in Michigan, and Sheboygan in Wisconsin average quite high. Waukegan and Racine are far above the average. Therefore the condition is not remote and to be dreamed about. It is immediate and to be acted on.

Lake Michigan is the common charge of the national government, the state governments of Wisconsin, Illi-

nois, Indiana, Michigan, and also of the large centers of population located on the shores.

Acting on a conception of these responsibilities in May of 1908 the Mayor of Chicago asked for the appointment of members of the Lake Michigan Water Commission on the following basis:

	Representatives.
The Public Health and Marine-Hospital Service	1
The Engineering Corps of the War Department	1
The State of Wisconsin	1
Milwaukee	2
Illinois	1
Chicago	3
Indiana	1
Indiana cities, located on Lake Michigan	1
Michigan	1
Grand Rapids, Mich.	1

The commission is now composed of Major Judson, Mr. Hill and Professor Sackett, engineers; Professors Bartow and Barnard, state chemists working especially on water surveys; Dr. Gehrmann, bacteriologist; Dr. Young, Dr. Bading, Dr. Sutherland, Dr. Shumway, Dr. Evans, national, state and municipal health officers; and Mr. Becker, ex-mayor of Milwaukee. Lack of appropriations in Michigan have made it necessary for Dr. Shumway to withdraw.

Right speedily the importance of this matter impressed itself on the Chicago Association of Commerce. They called a meeting of representatives of the city governments and business bodies of the various towns located on or near the lake. Fifty-six cities responded. An organization was perfected. The object of this organization is to secure popular and governmental support for the policies advocated by the commission. The first body is for research; the last is to make effective the work of the first. This last organization is the Lake Michigan Sanitary Association. Out of these two organizations have grown two other loose organizations. The towns of northern Indiana have had joint meet-

ings of their city governments and business bodies, first, to advance the study of their sewage disposals and water supplies, and, later to find remedies or a remedy, for up to now, at least, all of the towns are joining in a single movement. The towns north of Chicago, to wit, Evanston, Wilmette, Kenilworth, Winnetka, Glencoe, Highland Park, Lake Forest, Lake Bluff, North Chicago and Waukegan have united to study their situation.

The method of the Lake Michigan Water Commission is to hold about four meetings a year to which reports will be made. Up to now the meetings have been devoted largely to the study of existing conditions. We are just beginning to discuss remedies. The investigations are done by the state and municipal boards of health. Four meetings have been held. The following are the subjects treated in the first volume of reports:[1]

Call for the Commission.
Letter of Dr. Evans to Mayor Busse.
Letter of Mayor Busse to the Chicago City Council.
Action of the Chicago City Council.
Letter of Mayor Busse to Administrative Officers.
Minutes of the meeting of April 18, 1908, at Chicago, Ill.
Articles of organization.
Minutes of the meeting of May 27, 1908, at Grand Rapids, Mich.
Minutes of the meeting of Sept. 10, 1908, at Milwaukee.
Minutes of the meeting of Jan. 23, 1909, at Indiana Harbor, Ind.
Report on Water Conditions in Michigan, by Dr. Frank W. Shumway.
Report on Water Conditions in Indiana, by Dr. W. A. Evans.
Report on Water Conditions in Wisconsin, by Dr. Q. O. Sutherland.
Report on Water Conditions in Illinois, by Dr. Edward Bartow.
"Currents in Lake Michigan," by Major W. V. Judson.
Extracts from paper by J. A. Amyot.
"Sewage Disposal Problems," by Lederer and Hill.
"Investigation of a Typhoid-Fever Epidemic at Sheboygan, Wis.," by J. T. B. Bowlles.

1. Now ready for distribution.

"Methods of Analysis," edited by Edward Bartow.

Report of Conditions of the Chicago City Water-Supply, by Dr. J. F. Biehn.

Report of Milwaukee City Water-Supply, by W. V. Judson.

"Control of Shipping," by Dr. G. B. Young.

"The Character of the Water-Supply of Michigan City," by H. E. Barnard and J. H. Brewster.

"The Sanitary Condition of the Southern End of Lake Michigan Border—Lake County," by H. E. Barnard and J. H. Brewster.

Report on State Control of Waterways, by Dr. Frank W. Shumway.

Report on a Filtration Plant at the Union Stock Yards, Chicago, by Dr. Adolph Gehrmann.

The investigations of existing conditions relates to:

1. The typhoid death rate (mortality and morbidity).
2. The diarrheal rate in adults other than tuberculous diarrheas (mortality, but principally morbidity).
3. The degree of organic pollution of the waters.
   (a) In the taps.
   (b) At the intakes.
   (c) At various points in the lake.
4. The degree ot bacterial pollution at
   (a) General; (b) colon.
      (a) The taps.
      (b) The intakes.
      (c) Various points in the lake.
5. The location of the intakes.
6. The location of the sewer outfalls, especially in relation to the water intakes.
7. The direction of Lake Michigan currents.
8. The purifying power of Lake Michigan water *in situ* and in the mains.

The commission is just beginning to study methods of sewage purification and the problems of the cities.

As usual Indiana leads. The report from Indiana is the most comprehensive and convincing of which I have any knowledge. The reports from Chicago are complete, but the report from the rest of the state is fragmentary. The Wisconsin reports are next in completeness. Michigan data are least complete. Few Michigan towns get their water out of the lake; many

put their sewage in and several take their water from bodies of water that are practically portions of the lake.

Studies made by these cooperating bodies have demonstrated several things. Other things seem probable though not proved. As a result of study of the conditions largely gained from the work of this commission, I hold the following opinions:

1. Lake Michigan water twenty miles away from large sewer outfalls is good, safe drinking-water and excellent in quality.

2. On account of the large volume of water, its low chemical content, and its temperature, it will take care of shore population much in excess of that now existing.

3. The present conditions of the shore waters near all sewered towns are such as to render their use for drinking purposes dangerous.

4. South of an east-and-west line passing through Seventy-fifth Street in Chicago to a similar point in Indiana (an area of nearly 100 square miles) the water is either all so polluted or so frequently and so easily made so that no city should take its water-supply from it and no boat should be allowed to fill its drinking-water tanks from it.

5. There are no constant currents in Lake Michigan.

6. The currents in Lake Michigan are due to the direction of the wind. There is always a surface current with the wind and usually a deep current opposite to the direction of the wind.

7. Irregularities in shore contour, for example, bays or promontories, at times will operate to protect an intake; at other times will have no influence on the water at the intake; at times will operate to foul such water, according to the direction of the wind. For example, a bay protected by a natural or artificial promontory on the north, with the wind in one direction, will have bad water pushed out and good water pushed in; when the

wind is in another direction the bad water would eddy around the intake.

8. In the Lake Michigan area there are no prevailing winds.

9. In Lake Michigan there are no prevailing currents.

10. As storms habitually stir Lake Michigan to a depth of 20 feet, frequently stir it to a depth of 40 feet and occasionally stir it to 60 feet, purification by sedimentation is not effective in water less than 50 feet deep in Lake Michigan.

11. As the highly effective saprophytes are not abundant in Lake Michigan, purification is by oxidation, dilution and sedimentation.

12. Therefore the rapidity of purification is not as great as it is in fouler waters with a high saprophytic bacterial count.

13. A flow of seven miles in Lake Michigan is not sufficient for the purification of a massive amount of sewage.

14. With a fairly high and steady wind sewage streams retain quite definite boundaries for several miles.

15. A flow of one mile in the lake is of greater purifying power than a like flow in a stream because of (a) the time required; (b) dilution. It is of lesser power because of (a) the less saprophytic bacterial count; (b) less oxygen absorption. Weighing both equations, one mile is more efficient in the lake, but a forty-mile requirement of river flow is not equaled by a one-mile lake flow.

16. Massive amounts of sewage containing much floating material will sometimes hold together in a definite lake stream for twenty miles.

17. No town should place its water intakes within 1 mile of the sewer outfall of a town of 2,000 inhabitants. This distance should increase *pari passu* with the number of inhabitants using the discharging sewers, other things being equal.

18. Dumping should not be allowed in water less than sixty feet deep in Lake Michigan.

19. Government navigation regulations should keep ships a certain distance from water intakes at all times. They should specify holding provisions, with dumping control on all streams. They should specify zones from which ship drinking-water should not be taken in all bodies of fresh water.

20. Properly controlled, Lake Michigan water will always be safe for drinking purposes.

21. Under present conditions no town is justified in using Lake Michigan water from a point nearer shore than one mile.

22. Large cities emptying their raw sewage into the lake should not take their water nearer any sewer outfall than ten miles.

23. What these states and cities bordering on Lake Michigan are trying to do should be done by the national government for the chain of lakes.

THE ECONOMIC VALUE OF PROTECTING THE WATER-SUPPLIES

HAROLD B. WOOD, M.D.
PHILADELPHIA

To conserve watercourses means to retain these resources in their natural condition, or in that condition which gives the greatest safety and utility to man. The pollution of a water-suppply is as unnecessary as the wanton butchering of wild animals or the reckless destruction of a forest; in either case the resource is partially or wholly obliterated, and the waste tends to destroy the available livelihood and comforts of the people. A polluted watercourse is not a natural stream.

Municipalities are not the only factors which are accountable for the pollution of public water-supplies. The influence of small villages, individual homes and factories on stream contamination needs more attention. The cities with more people and factories to a given area produce more pollution than the towns with their more numerous cesspools, yet the bacterial contamination is apt to be relatively less with a city, owing to the bactericidal activity of many factory wastes. The presence of disinfectant chemicals in sewage or in drinking-water is strictly objectionable if the sewage or water is to be subjected to filtration. Although in rural districts the more numerous privies cause relatively a less amount of direct stream contamination, the danger of pollution from individual houses can not be overlooked. That there is a great danger from rural communities is attested by the large epidemics which have been traced to individual cases of pollution. In the

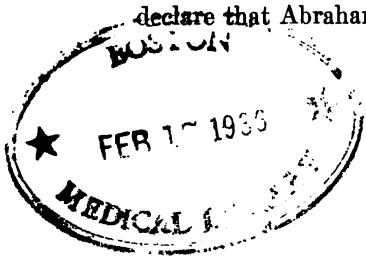
typhoid epidemics at Butler, Plymouth, New Haven, Nanticoke and Reading there were collectively 3,929 cases, with 361 deaths, resulting from the careless treatment of the discharges of but five individual patients.

The story of damage from epidemics resulting from polluted water is too well known to require repetition, save perhaps for an enumeration of the ways in which the pollution may occur, that the individual contaminating points may be sought and the danger averted. Epidemics from water-supplies result from contamination by various factors: the use of a raw water into which is continually discharged the sewage of other towns, as occurred at Pittsburg, Lawrence and Philadelphia; a city drinking the water of a lake which has become its own cesspool, as did Chicago, Cleveland and Burlington; pollution of the water by the wastes of individual houses, institutions or factories, as at Plymouth, and pollution from privies situated directly over the streams or on the banks, as at Ithaca, or indirect pollution of the stream after the offending matter has been deposited on the surface of the ground or in wells, later gaining access to the watercourse by the washing of rain or seepage through ground seams. In some instances epidemics originate through criminal thoughtlessness when a town has been already supplied with pure or purified water. A water-pipe laid through a polluted pond may become sufficiently disjointed to permit admission by the infected water, as occurred at Baraboo, Wis., and Palmerton, Pa. The admission of polluted water to a pure city supply at any time is inexcusable. Epidemics have originated at times of fire (Lawrence), through failure of valves to operate (Wilkinsburg, Pa.), when the ordinary supply was judged to be insufficient and no public warning was given of the substitution (Newburyport), or when polluted water was furnished temporarily while the filter-plant was undergoing repair (Lowell, Mass., 1902, Brewer, Poughkeepsie, N. Y., and Millinocket, Me.). Various public

wells becoming infected through ground seams have caused epidemics of typhoid fever, as at Trenton, Newport and Mount Savage, Md.

THE VALUE OF HUMAN LIFE

Various attempts have been made to determine the exact financial loss occasioned by the invasion of an epidemic or a polluted water-supply. It is possible to estimate the approximate saving of life through safeguarding the public interests; the approximate number of lives saved by the installation of a water filtration system may be easy. But to put on the credit column of the ledger page for comparison with the debit of the filtration plant the actual value of the lives saved, with the dollars saved in wages of the deceased people, is an utter impossibility. All attempts to place an exact cash loss caused by any fatal calamity have and must result in failure. In estimating the loss from a fire the cost of rebuilding and probable loss from earning capacity during the period of construction can be roughly figured, but the other factors, inconvenience, effect on prestige, result of public attention, loss of unforeseen opportunities, etc., can not be surmised. Equivalent conditions affect the estimation of the value of human life and the cost of sickness. In estimating the financial loss during the illness of an individual or number of individuals the cash loss to that individual may be computed, but not the loss to his employer. Much less can there be calculated the wage loss occurring through death. It is obviously impossible to estimate how long a man's income will continue, to what extent it will fluctuate, of what value that income will be to himself and his dependents, and how much of that income will be inherited by others. Rochard says that the economic value of an individual "is what he has cost his family, the community or the state for his living, development and education." To accept such a standard would be to declare that Abraham Lincoln was worthless.



A man's value is not to be estimated by his income or bank account alone, but by his real influence, morally, mentally and physically on his family and the people at large. The man who spends much of his spare time at home and gives much comfort to his family is obviously of more value than he who does little for his wife and children except to pay the rent and grocery bills; he who ~~influences~~ his own or other ~~peoples'~~ ~~children~~ to improve in morality, industry and citizenship is greater than he who has little regard for such activity; the man who actually earns his money is of more value than he who inherits his sustenance, yet their wills may dispose of similar estates. These conditions are but a few of the many which must be considered when estimating the true value of a human life, and plainly show the absurdity of attempting to put on paper the loss caused by death. The human life is valued at $25 by Galton, $219 by Rochard, $776 (159 pounds) by Farr, $976 (200 pounds) by Chadwick, $2,000 by E. F. Smith and $5,000 by some others. French soldiers are rated at $1,200. The average price of slaves sold in America was about $1,000. Such estimates are obviously too low for any practical purpose. The legal value of life is almost entirely dependent on the force of the plea of the counsel.

Another error in estimating the human value is in the choice of incidental expenses. For instance, Wing, in attempting a concrete study of the cost of typhoid fever to Pittsburg, added into the expense account the extra cost of milk and ice used for the patients, neglecting to subtract the money saved by restricting the diet. Funeral expenses, $3,186 for 26 deaths, were included—an obvious mistake, because they are necessary expenses which must come at some time. Should it become necessary, as it unfortunately frequently is, to use concrete figures to convince lawmakers and the public of the benefit to be derived by protecting the public health, recourse must be had to the financial loss through the prevalence of

sickness, including a list of the number of deaths, with a brief on the general loss to the public and private citizens occasioned by the mortality.

In reaching the estimate of the financial loss occasioned by sickness the sum total of the individual cases must be considered. In this there should be included only the value of the medical attendance, cost of nursing, extra servants, hospital expenses, medicines, special apparatus or appliances bought, extra ice and difference in cost of food supply, to which is added the loss of wages calculated up to the time when the patient attains his original vigor and wage-earning capacity. To this money loss, credited to those that recover, is appended the simple statement of the number of deaths, without attempting to express their loss in dollars. For a very rough working hypothesis of the financial loss, if this be required, the loss may be estimated as double the wages lost through illness and convalescence, with a minimum average of $3 a day, added to a bald statement of the number of lives sacrificed. Those who control means for the safeguarding of human life should use, if need be, for the value of life the personal standard placed on their own families. It is, therefore, very misleading to attempt to employ any set figure as the value of human life.

POLLUTION BY FACTORY WASTES

Manufacturing plants are not a danger from their sewage alone, but their liquid wastes when discharged into watercourses are undoubtedly a damage which needs correcting. Factory wastes are not only a menace to the individuals consuming the water, but are a detriment to other mills and are destructive to fish. By discharging offensive wastes into streams, ponds or lakes the manufacturer disobeys the clearly enunciated, universal law of water rights which commands that factories must allow the water leaving their mills to be as pure as when they receive it; the riparian manufacturing proprietor

may use the water in any manner as long as he does not interfere with the purity of the stream or with the rights of others below him. Because of this factory pollution there has resulted much litigation; old established mills have been badly affected by the new factories up-stream; paper mills have been ruined and others forced to seek new quarters. In Rhode Island a bleachery obtained an injunction against a wool-washing concern, with the result that now the discharged water is subjected to settling basins, treated with sulphuric acid, the extracted grease collected in bags, pressed hot and made into dégras for finishing leather. The effluent is subsequently run through a sand filter. Woolen-mills and print-works have obtained similar injunctions against other wool-washing works up-stream, and many paper-mills have been rightfully sued.

Chlorinated lime from paper or cotton bleacheries when discharged into a stream grossly polluted by sewage will act as a partial purifier through its disinfectant effect, but the quantities added are in such excess of what is needed that a poisoning of the water results. The indications are that chlorinated lime can not serve as a coagulant in the manner of slacked lime, and will, therefore, not settle to the bottom of a river. Leighton asserts that acid coal mine wastes are, bacteriologically, a benefit in the Susquehanna River.

POLLUTION DESTROYS FISH

The scarcity of food fish is largely due to the pollution of the streams. Some coarse fish apparently thrive near a sewer's mouth, but may be rapidly killed by a discharge of sulphuric acid or other waste. The destruction of fish by sewage-laden water is due to bacterial contamination, to various salts or to gases of decomposition, ammonia and sulphuretted hydrogen. Marsh is of the opinion that the exhaustion of the dissolved oxygen causes the fish mortality. The Passaic shad industry was utterly destroyed by pollution in the river.

In many cases fish are destroyed by factory wastes. Dead fish were found in countless numbers after arsenated water was discharged once from a dye works. Sulphuretted hydrogen from starch works, lime from bleacheries, gluten from glucose works, coal-mine and culm bank washeries and decomposing animal matter are all causing enormous destruction of fish. Sawdust and wood pulp destroy trout and bass. The wastes from woodpulp mills, oil wells and gas factories make fish life impossible (Leighton, Marsh, Sweeney). The stocking of streams by the planting of young fry is frequently a failure because of water pollution. The fresh content of a stream may usually be regarded as a relative indication of objectional pollution, as the salt content is considered as a relative indicator of sewage.

The sewage and factory pollution of the streams, with the noxious odors and surface impurities, and with the resulting absence of the smaller fish, is an important factor in the scarcity of game and other birds on the shores. The same causes make it impossible for people to live near some streams or to water live stock therefrom. Realty values decrease markedly along streams which become polluted. Land along the Passaic River that commanded values of $500 to $800 an acre for farming a few years ago possessed no value at all in 1902.

Since factory pollution is frequent and easily visible, its presence may best be detected by those who are accustomed to visit the manufacturing plants. Factory inspection is a necessary requirement in every state and city, but it seems advisable to place it under the guidance and control of a state department of health; at least, the inspectors should be required to submit sanitary reports to the health bureaus. It is most philanthropic for the factory inspectors to determine the presence of any employés under the legal working age, but more benefit would be derived if more attention were given to the sanitary and health conditions af-

fecting the individuals. It should not only be determined that proper toilet facilities were provided for the employés, but that these toilets are properly located and maintained, and are not a menace. Too many factory toilets are built directly over streams and conducted in such a way that flies may readily carry germs to food-supplies. To determine the age of a child in a factory may save a single life, but to determine where that child has been forced to deposit his discharges may save a hundred. It is the saving of the masses that must be perfected.

No untreated offensive factory waste should be permitted to be discharged into watercourses. Such wastes, as dyes, chemicals, acids and bleaching powders, should be subjected to appropriate chemical precipitants or to coagulants that will render the effluent from settling-basins clear, colorless and free from contamination. For many wastes, aluminum sulphate is the safest and most effective coagulant, but for others ferrous sulphate or slaked lime is preferable. Coke filters possess an absorptive power for many coloring matters (Dunbar). In some cases, as with brewery wastes, it may be more satisfactory to include the factory wastes with municipal sewage rather than to attempt to treat them separately. If possible the wastes should be converted into industrial profit, as is being attempted with sulphite pulp waste.

EFFICACY OF FILTRATION

The influence exerted by the establishment of sewerage and of water filtration is clearly shown by the following table of the typhoid mortality:

Rate per 100,000 Population.	Before Sewerage.	After Sewerage.	After Filtration.
Boston	174	60	20
Lawrence	96	18	2.1
London	90	50	14
Berlin	92	50	5
Breslau	92	40	9
Munich	254	27	9
13 Mass. Cities, average	79.4	38.3	

In other words, water filtration caused a reduction in the typhoid mortality rate of 98 per cent. at Lawrence, 90 per cent. at Ashland, Wis., 80 per cent. at Binghamton, N. Y., 76 per cent. at Philadelphia, 75 per cent. at Watertown, 66 per cent. at Boston and 60 per cent. at Albany.

The bacterial efficiency of sand filters shows that practical application does not fall much below experimental results. In the experimental sand filters at Lawrence 99.48 per cent. of the bacteria were removed, and at the Pittsburg experimental plant 99 per cent. In practice the efficiency of the Providence filters is 99.68 per cent.; Philadelphia, 99.59 per cent.; Rensselaer, N. Y., 99.48 per cent.; York, Pa., 99.57 per cent.; Lawrence, 99 per cent.; Loraine, Ohio, 98 per cent.; Elmira, 98.43 per cent., and Norfolk, 95.99 per cent.

Turbidity is another objectionable condition removed by water purification. It is not only an esthetic objection, but in various industrial establishments an actual menace, and frequently necessitates the installation of private filters. These filters are not sufficient to remove all turbidity and coloration. The removal of fine mineral turbidity, such as comes from clay and culm, can not be accomplished by slow sand filtration, but requires a coagulant.

The turbidity from culm comes principally from the washing of the culm banks in the recovery of buckwheat and rice coal.

Rural contamination of streams should receive more consideration than has been accorded to it; and means must be adopted to check the damage resulting from privies which are placed over streams or on the river banks, and from remote factories discharging into the watercourses. Camps, be they for military, for pleasure, for workman or gypsies, should be so located that the privies are situated far from all streams and far from the camps themselves. It is preferable for the toilet to be erected on the summit of a hill, provided there be

no pump or well immediately below. Since it is possible for the direction of flow of ground water to be in the opposite direction to that of surface water, as toward a hill summit, in locating wells and cesspools the position of the near-by large watercourses must be considered. Ground water tends to flow toward the larger streams or rivers, without being necessarily influenced by intervening hills. The epidemic at Ithaca probably resulted from a gang of Italian railroad workmen establishing their camp along the water supply. These camps should have definite latrines erected, the location of which should be occasionally changed.

Some writers persist in saying that there is no objection to a farmer emptying sewage into a stream, and Lake adds the provision, "if the stream is not used for domestic supply." A stream not used for a domestic supply is a rarity; except in few unsettled districts, all streams had better be regarded as domestic supplies. To empty sewage into a watercourse is probably more dangerous than the use of the old-fashioned privy, except where the privy is in immediate proximity to a well.

Stream pollution is far more dangerous than the use of a properly situated, properly constructed and protected privy. Sanitary engineers accept the theorem that it is the time consumed and not the dilution or rapidity and turbulence of a river that is most responsible for the bacterial purification of streams. If typhoid germs are discharged into a stream which flows at a rate of five miles an hour, which is a comparatively quiet stream, accepting Russell's results that the germs will die in five days, those germs could be carried 600 miles, surely far enough to reach some domestic supply. Hence it may be concluded that any pollution, however remote, is apt to affect some consumer, unless it occurs near the sea.

To assist in the purification of watercourses, physicians should be required to disinfect all discharges

from typhoid and tuberculous patients. Physicians should be more prompt in reporting infectious cases, being required by law and encouraged by printed postals. They should report cases of insanitation coming under their notice. Local health officers and factory inspectors should inspect temporary camps of workmen and pleasure seekers, and should inspect and report to a central authority all examples of stream pollution from towns, houses and factories which occur within their precincts, as well as any gross polluted appearance of the watercourses. The finding of dead fish in a stream, being indicative of some kind of pollution, should lead to an inspection, and the saving of fish should be an object. Before establishing a filtration system cities should determine the feasibility of obtaining water from an unpolluted locality which can be kept under control. Watersheds should be patroled. A good man on the alert can patrol a large district, getting his information through various ways and personally inspecting all suspicious localities frequently.

By securing legal enactment and arousing public sympathy through the use of statistical and experimental evidence, with the use of uniform standards to represent financial results, the work of the sanitary corps is strengthened. Their work becomes more efficient by obtaining notices of legal or hygienic encroachments through such channels as information can come, and eternal vigilance on the part of the few brings success and life to the many.

5038 Pine Street.

ABSTRACT OF DISCUSSION

ON PAPERS OF DRS. EVANS AND WOOD

DR. W. K. JACQUES, Chicago: I drink Lake Michigan water, and I think that every one who is thus afflicted ought to be thankful to Dr. Evans for this paper and also for the water commission which was started under his influence and instigation. If it keeps on as it has begun, the data which will soon be collected will be of the greatest value to those who are

obliged to depend for their drinking water and domestic water supply on Lake Michigan and the tributary lakes. It is strange that the very people most interested are the people who do not care to take part in this sort of thing. As an illustration, I have a summer home across the lake in a small city, and when I first went there the people of that town were depending on the disposal of excreta in privies, as in ordinary country places. Within five years a sewer has been opened and extended down into a little river which passes through the center of the city. The water supply is taken in along this river from Lake Michigan. Since the sewer has been emptied into the river typhoid has been a veritable scourge in that town. Last winter it was decided that something must be wrong with the intake; a diver investigated and found twenty-three places where the intake was defective and the river water was going in through the intake. That is, he reported twenty-three places; and that is all they had money enough to repair.

Now, the City of Chicago sends to this city over a hundred thousand people every summer, a large proportion of whom are young and especially susceptible to typhoid infection. It would pay Chicago to extend that water intake; but we, of course, are unable to do it; and this state has withdrawn from this commission; so that the very state that needs it most will get the least benefit from the commission. The proper disposal of this sewage before it is even emptied into the river and the extension of that intake a mile out into the lake are what should be required.

DR. L. H. MONTGOMERY, Chicago: I was pleased to hear Dr. Evans in his paper state that, in his opinion, the federal government should have control or supervision over the chain of our northern lakes, having reference, of course, to the pollution of the water. I do not know whether he intended to intimate that the general government should have control of the rivers discharging their waters into those lakes. I would favor federal control of streams and rivers as well, as many, if indeed not all of these larger rivers serve as open sewers throughout the United States. We seldom hear of any one being prosecuted for pollution of rivers; factories are located on rivers and lakes; discharges are emptied there by the employees; and while many of the commonwealths have laws prohibiting pollution of springs, lakes, rivers and other sources of fresh water for domiciliary purposes, yet the legislatures do not make the financial appropriations for the observance of such laws and the punishment of violators thereof. This pollution goes on year after year, then somebody awakens, and, as Dr. Jacques says, money is appropriated which goes so far and no farther, partly removing the trouble while the menace to health still goes on in a degree. There is negligence, and it is often, I believe, from lack of appropriations that state

authorities do not go ahead and carry out the law. I believe that the national government should have control over all these matters connected with our great rivers and lakes throughout the country.

DR. W. FORREST DUTTON, Walker's Mills, Pa.: I believe that the members of this Section who were in Chicago last year remember the courtesy shown us by the City of Chicago when, through the hospitality of Dr. Evans, we were shown the wonderful mechanism of Chicago's water supply. To my mind, it is one of the most wonderful pieces of sanitary work that I have ever seen; and I believe that the municipality of Chicago does not really appreciate the hard work that Dr. Evans has put into its department of health. I believe that if Dr. Evans is maintained at the head of the department of health in the City of Chicago, in a very few years he will make it one of the cleanest cities in the world; whereas, some few years ago, it was referred to as one of the dirtiest. Coming a little closer home, to the City of Pittsburg, since the installation of its filtration plant, the rate of typhoid mortality has been reduced from 200 per 100,000 to about 15 per 100,000. It is impossible to filter the steel mill chemicals from the river water. These so irritate the intestinal tract that it readily becomes a point of attack for the typhoid bacillus. If the large municipalities throughout the United States had such officials as Dr. Evans of Chicago, Dr. Hurty of Indianapolis, Dr. Bracken of St. Paul, and the eminent sanitarian, Dr. Egbert of Philadelphia, we should have a much better record to show to our brethren abroad.

DR. SENECA EGBERT, Philadelphia, Pa.: I would like to take issue with Dr. Montgomery as to the government taking charge of all rivers and streams. I believe that the government should take charge of the great chain of lakes, but we are demonstrating in Pennsylvania that we do not need the United States government's help. With a fair appropriation from the state legislature, and men who have nerve enough to do the work, it can be done by the states. I am enough of a states' rights' man to believe in that sort of thing. It was said not long ago that the Pennsylvania State Commissioner of Health had cleaned up over 4,000 sources of pollution along the Schuylkill that supplies most of Philadelphia with water. Those of us who live in Pennsylvania all know that a tremendous amount of work toward the protection of the streams can be done—and has been done—by a man who has the power of the state back of him, a good, thorough appropriation, and then enough nerve to do the work. More than that, I think Philadelphians as well as Pittsburgers have appreciated the benefits of the improvement of the water supply. In my own ward, one of my near neighbors, a practising colleague, a few years ago had 30 cases of typhoid fever in a year; he now

has 3. We are practically eliminating typhoid from Philadelphia, which used to be notable for its excess of this disease.

There is another phase of the question: Since we have learned so much in the last two or three years about typhoid bacilli-carriers, it seems to me that the importance of this question of the non-pollution of streams is greater than it ever was before. We know now that people traveling from place to place can still carry the infection of a typhoid attack of months or years before to those places; and if the drainage from any privy or cesspool can get into the water supply, they may become sources of typhoid infection to large numbers of people. Many and many a small town, and almost all the smaller hamlets, have no common water-supply or any sewer system, and the people rely on the old-fashioned well and the old-fashioned privy vaults. In such places the danger of infection must be occasionally present and we cannot give too much attention to this problem.

DR. MARSHALL LANGTON PRICE, Baltimore: There is a single point in Dr. Wood's paper that I want to touch on; that is the estimate of the economic loss caused by the death of a human being. It is admitted, of course, that any computation is unsatisfactory, and often inaccurate; but whether we have an accurate or inaccurate standard, we ought to agree on some standard of computation. I recently recommended for that purpose what I call the life-capital method. That is, computing an indivdual's earnings up to the time he becomes economically disqualified, or up to the time of his death, we can calculate the loss in life capital by using any of the standard life-tables. From these we can calculate the average expectancy of life at the time the individual dies of any disease such as typhoid. If a man earns $2 a day from his eighteenth to his thirtieth year, he will accumulate $10,000 life-capital: that is, he has lived a $10,000 life. Of course, if those earnings are interrupted by death or disease, he has evidently lost part of his life-capital—that which under the life-capital method he would have earned if he had remained alive to his thirtieth year. You have to give definite limits to the working period; but it strikes me that it is about the best standard which we can devise at the present time as a unit, and one least liable to misconstruction. In regard to typhoid being a rural disease, that fact was first pointed out by a civilian, Colonel Waring. The subject was later exhaustively described by Dr. Fulton in a careful comparison of rural and urban typhoid fever; and he found, in his studies, that the rural mortality was very considerably higher, I think almost 50 per cent.

DR. JOHN S. FULTON, Baltimore, Md.: I classified more than 300 cities according to their populations, and found that the five largest cities in the United States had the lowest typhoid mortality, averaging about 25 per 100,000. The average for

these five cities, at this time, would be found lower. From this minimum of 25 per 100,000 the mortality was found to increase as the scale of population diminished, until the heaviest typhoid mortality was reached under truly rural conditions, i. e., where only about 10 per cent. of the people live in towns. Rural populations suffered a typhoid mortality of about 65 per 100,000. Pittsburg caused an irregularity in this descending scale of mortality, the monstrous mortality of this city raising the average for all the cities of that class to about 45 per 100,000. While the article to which Dr. Price refers may have been the first in which convincing figures were shown, it was not far ahead of Dr. Egbert's article in which the same conclusion was reached. Long before either of us looked into the statistics, Colonel Waring said, in the introduction to his work on "Sewerage," that typhoid fever is a rural disease, and its progress is in general from the country to the city, rather than from the city to the country. It was a layman, therefore, and not a physician, who first called attention to the error, so prevalent among medical writers, of discussing typhoid fever as one of the chief scourges of cities.

DR. F. W. SELL, Rahway, N. J.: I want to speak a word for New Jersey, and to say that we have now, I think, taken an advanced position, alongside of Pennsylvania, Massachusetts, and New York, in the way that our state board of health is supervising the disposal of the sewage of towns on our watersheds. I think that there are no less than 53 disposal plants now under the supervision of our state board either on the shore or on inland watersheds. Individual cities have tried to oppose the putting in of these plants because of lack of education. They do not seem to realize the necessity of it; but the time will come, I feel sure, when they will all fall in line; and one very great sign of the times, I consider, is shown in the cooperation of the states of New York, Pennsylvania and New Jersey along the Delaware, in a similar manner to that of the cities and states which Dr. Evans has described.

DR. J. H. WHITE, New Orleans: I do not believe that national control should be extended any further than that point at which the people with practical unanimity shall propose the surrender of their authority to the nation and admit that the job is too big for them. The point where national control should come in (and this is what Dr. Evans claims) is on waters that are interstate, on waters which involve, especially, as the lakes do, not only interstate, but international issues, and in similar cases. I am a representative of the national health service, and I want to make it plain that we are not trying to gobble what does not belong to us.

DR. W. A. EVANS, Chicago: The situation in Chicago is this: Twenty-four miles north is Waukegan, a city of 30,000. The intervening distance is solidly filled in with smaller towns. The sewage of these, nearly always raw, is poured into the

lake. The drinking-water is taken from the lake at points always less than one mile from shore. No intake is more than two miles from the nearest sewer outfall and some are much nearer. The water is not filtered. Then comes Chicago's twenty-five miles of lake front. In this sweep no sewage enters the lake except through the Calumet River, located two miles from the Indiana line. In it there are six water intakes; one, about two miles from Chicago's north line, is located close in shore, but is supplied with a filter; the others are from two to four miles out; they do not have filters. Joining us on the south are Hammond, East Chicago, Indiana Harbor, Whiting and Gary, having a combined population of about 100,000. These towns put one-half their sewage into the Calumet River and the other half directly into the lake. The Calumet River receives the sewage of about 200,000 people; 50,000 in Indiana and 150,000 in Chicago and Cook county outside of Chicago. None of this sewage flows over ten miles in the river and the bulk of it flows less than three miles in the river. About half the Calumet River is in Indiana and half in Illinois. Its mouth is in Illinois two miles from Indiana. The Indiana towns, except Gary, have water intakes within a few hundred feet of shore and a few hundred feet of sewer outfalls and are without filters. The sewage is raw. From the Calumet River to the nearest Chicago intake is about four miles. From the Calumet River to the farthest Indiana intake, except Gary, is about five miles.

There are no constant water or wind currents in Lake Michigan. The current is with the wind. A lake flow of five miles is not sufficient to purify a large volume of sewage. When a strong north wind blows every town is polluted by the town north of it. And the Calumet River, carrying Chicago sewage, pollutes the Indiana towns. When the wind is from the southeast the Indiana sewage pollutes the Chicago water and every town up to Waukegan is polluted by the towns south of it.

Whose problem is the Calumet—half in Indiana, half in Illinois—discharging in Illinois two miles from the line, and with a lake flow into Indiana waters whenever the wind is from the west or north? Can any government handle a problem like this except the national government? Are not lines of demarkation between states theories, while a stream of sewage pollution from the Hammond sewer to the Chicago intake is an actual condition? If the national government has not now a way, is it not up to them to find a way?

Then there is the matter of dumping dredgings into Lake Michigan near water intakes. Much of this dumping is done under contract with the War Department. In Chicago waters most of this is clay and it is dumped in water sixteen feet deep. Storms stir Lake Michigan to a depth of fifty feet at times. Consequently our drinking-water is often muddy after

a storm. We are insisting that this dumping be done behind breakwaters or else in water over fifty feet deep. The position taken by the chief of engineers is that the government has exclusive control of dumping, the city has no authority, but that the government has no right to be swayed by any consideration of health. To this I would say that if the government officials finally conclude they have now no way, it is up to them speedily to find a way.

I wish to mention another point before concluding. I know of a town near Chicago which has located its intakes with relation to its sewer outfalls on the basis of a continuous lake flow in one direction, and not far away is another town which has its water intakes located on the basis of a flow in the opposite direction. Each is wrong.

DR. HAROLD B. WOOD, Philadelphia: To her honor, include New Jersey with New Hampshire. These are the two states having the lowest typhoid mortality rate. In Pennsylvania, Dr. Dixon, that he may best overcome the rural typhoid mortality, is having sanitary surveys made of all streams. The work at present is being done in the western part of the state, having accomplished a sanitary survey of every tributary of probably three-fourths of the Allegheny river. In regard to the utilization of privies: Sanitarians have been working for some time to abolish privies, warning the people, but advising them of no methods for a proper sewage disposal in the country places or for factories situated along streams. One town in the South, of probably five or six hundred inhabitants, uses, I am told, about forty privies situated along a river bank overhanging the stream. The lack of danger from some privies (that is, excluding the danger from fly contamination) where they cannot pollute water supplies, can be well illustrated by the case of Media, Pa. Recently I talked with a physician who said that in the last ten years there had been not five cases of typhoid fever in Media, a city of about 4,000 inhabitants. Dug privy wells is the only sewage disposal. The water is entirely pumped from a nearby stream, an excellent water, practically under control. One of the contentions to be met in Philadelphia is the impatience of the people. Recently there has been a small typhoid outbreak there in the northern part of the city, that part which has just been supplied with filtered water. Immediately the newspapers and the general public concluded that there was an inefficiency in the slow-sand filters. There is no doubt that the infection came almost entirely through food-supplies, flies and importation. In this outbreak the milk supply could be excluded. Some of the people in Philadelphia doubt the utility of the filters on account of their not excluding all turbidity, never having been instructed by the newspapers, or in any other way, that the finest turbidity cannot be removed by slow-sand

filtration. Of course, it must be admitted that it is extremely difficult to detect the typhoid bacillus in water. While most experimenters adopt the Drigalshi-Conradi method, Dr. Bergey employs a test founded on the fermentative ability of the bacteria; and Dr. Rives, Pennsylvania's state bacteriologist, depends on his colorimetric test. A sanitary inspection is of as much value and dependence as a laboratory analysis of a water. In view of doubts expressed, the evidence is conclusive that water is contaminated and often transmits disease.

THE PREVALENCE OF RABIES IN THE UNITED STATES

JOHN W. KERR, M.D. AND A. M. STIMSON, M.D.
Public Health and Marine-Hospital Service
WASHINGTON, D. C.

The identity of rabies as a definite disease appears now to be generally accepted, although there is still some question as to its etiology. The impression has prevailed, however, that the prevalence of the disease among both man and animals was exaggerated and that press reports of rabies among animals were in most instances erroneous.

That rabies has been endemic in the United States for more than a hundred years is shown by reports of cases and references to the disease in the medical literature from time to time during that period.

In reviewing the history of rabies in America, Ravenel states[1] that the first outbreak was reported from Boston in 1768, that it appeared in Philadelphia in 1779, that it was prevalent throughout the Northern states in 1785, and that soon after that time it spread to the Southern part of the country.

Reports of the disease have also appeared in newspapers from time to time for over a century; one of these, published in 1798 and recently quoted by Peters,[2] indicates that the disease prevailed in Massachusetts at that time.

There has undoubtedly been considerable variation in the prevalence of rabies from decade to decade, which

1. Ravenel, Mazyck P.: Bull. 79, Dept. of Agric., Pennsylvania, 1901.
2. Peters, A.: Rabies in Massachusetts, Am. Jour. Pub. Hyg., February, 1907, p. 94.

fact has been responsible for inquiries in the past regarding the disease. Outbreaks in Massachusetts and other places have been observed within a year or two and invited attention to the desirability of further studies as to its general prevalence at the present time, and the means necessary for its control.

The Legislative Council of the American Medical Association, which met in Chicago, Dec. 10, 1907, adopted resolutions to the effect that rabies should be investigated by the U. S. Public Health and Marine-Hospital Service with the view to its prevention and control.

Provisions for investigations of rabies as it affects man had previously been included in a measure which was introduced into the Sixtieth Congress, and which it was expected would become a law. In view of the adoption of the above-mentioned resolution, however, it was decided immediately to resume laboratory investigations and to institute preventive treatment for the protection of persons bitten by rabid animals.

The Surgeon-General accordingly instructed the Director of the Hygienic Laboratory to undertake the preparation of rabies virus in connection with other investigations, and treat any persons who had been bitten by rabid animals and who might apply for such treatment.

The large demand for virus from different parts of the country indicated a widespread distribution of rabies throughout the United States. It, therefore, seemed desirable to determine as far as possible the geographical distribution of the disease as indicated by deaths among human beings and prevalence among animals.

SOME PREVIOUS REFERENCES TO THE PREVALENCE OF RABIES

In 1900 Salmon[3] reported an extensive investigation into the prevalence of the disease. He reported 230

3. Salmon, D. E.: Year-Book Dept. Agric., 1900.

deaths among human beings in seventy-three of the principal cities of the United States during the decade, 1890 to 1899. He also detailed reports of the existence of the disease in man or animals in the twenty-five states as follows:

Massachusetts	Montana	Maryland
New York	Colorado	North Carolina
Pennsylvania	Nebraska	Louisiana
Illinois	Minnesota	Delaware
Iowa	Ohio	South Dakota
Indiana	Alabama	Kansas
Missouri (?)	Tennessee	Oklahoma
Wisconsin	Maine	West Virginia
		Wyoming

From the data presented, he concluded that rabies was much more common than had been supposed.

In 1906 Schroeder,[4] in discussing the prevalence of rabies, presumably in animals, quoted the Chicago *Chronicle* of Sept. 22, 1906, to the effect that rabies had existed during that year in the following fourteen states: Massachusetts, Ohio, North Dakota, South Dakota, New York, Michigan, Connecticut, Indiana, New Jersey, Kentucky, Pennsylvania, Delaware, Illinois and Rhode Island. In addition, Schroeder knew of cases in Maryland, Virginia, North Carolina and the District of Columbia.

In 1908 Hart[5] reported especially the prevalence of the disease in the District of Columbia, and stated that since 1903 positive cases had been diagnosed at the pathological division of the Bureau of Animal Industry from the following states: Virginia, Maryland, Indian Territory, Indiana, North Carolina, South Carolina, Georgia, West Virginia, New Jersey, Maine, and Wisconsin. He also referred to reports of its prevalence in Pennsylvania, Connecticut, Florida, Mississippi, New York, Illinois, and Minnesota, and stated that there was abundant evidence to warrant the statement that not a single state was free from the disease. Interesting facts on the prevalence of rabies are in the appendix to a

4. Schroeder, E. C.: Circ. 120, Bureau of Animal Industry, 1908.

5. Hart, G. H.: Circ. 129, Bureau of Animal Industry.

report[6] issued in 1900 by the Committee on Public Health of the Medical Society of the District of Columbia. Among the localities mentioned is California.

Many similar references might be made to reports of cases and estimates of its prevalence scattered through the literature. The assembling of such isolated references would be of much interest, but it is doubtful if they would render clearer our knowledge of the general prevalence of the disease.

In 1901 Ravenel[7] stated that there was no systematic report of rabies in the lower animals in any state, so that it was impossible to give any idea of the number of dogs or other animals affected yearly. He expressed the belief, however, that the disease was more prevalent than was generally supposed, and that it would increase unless controlled by means of efficient laws.

Moore[8] has also stated that the prevalence of the disease can not be accurately determined as there are no reliable statistics concerning it.

The same statement in a measure applies also with respect to the prevalence of the disease among human beings.

MORTALITY STATISTICS OF RABIES

On account of the almost uniform fatality of rabies among human beings, complete mortality statistics, if available, would give a fairly accurate idea of the geographical distribution of the disease. Unfortunately such statistics for the entire country are not available.

The Bureau of the Census has collected statistics[9] of rabies in the registration area, the deaths by years from 1900 to 1907 being given in Table 1.

TABLE 1.—DEATHS FROM RABIES IN THE REGISTRATION AREA OF THE UNITED STATES, 1900 TO 1907

1900	1901	1902	1903	1904	1905	1906	1907
33	41	45	43	38	44	85	75

6. Bull. 25, Bureau of Animal Industry, 1900.
7. Ravenel, Mazyck P.: Bull. 79, Dept. Agric., Pennsylvania, 1901.
8. Moore, Veranus A.: The Pathology of Infectious Diseases of Animals, p. 406.
9. Mortality Statistics, Bureau of the Census, 1904, 1906-1907.

The registration area comprised fifteen states, the District of Columbia, and seventy-eight cities, and contained an estimated (1906) population of 40,996,317. The total estimated population of the country during that year was 83,941,510.

The census statistics indicate that in 1906 and 1907 there were almost twice as many deaths from rabies as had occurred in any previous year since 1900. These deaths were distributed as shown in Table 2.

TABLE 2.—DEATHS FROM RABIES IN THE REGISTRATION AREA OF THE UNITED STATES, 1906 AND 1907

	1906		1907	
In Registration Area.	Cities.	Rural.	Cities.	Rural.
Connecticut	5	1	2	1
District of Columbia	0	0	1	0
Indiana	1	4	1	2
Maryland	2	0	0	0
Massachusetts	5	3	3	0
Michigan	2	2	1	2
New Hampshire	0	0	1	0
New Jersey	5	4	1	3
New York	15	1	27	3
Pennsylvania	10	4	2	10
Rhode Island	2	0	0	0
Cities in other states	19		15	
	66	19	54	21

PRESENT INQUIRY INTO THE PREVALENCE OF RABIES

When prophylactic treatment of rabies was begun by the service in April, 1908, preparations were also made to secure information regarding the occurrence of the disease throughout the country. Every effort was made to secure information regarding cases reported, and a letter was addressed by the Surgeon-General to health officers in every state and requesting their cooperation in the collection of data.

It was not expected that the facts elicited would by any means represent the exact prevalence of the disease, but rather its geographical distribution. This latter information is of importance from a public health standpoint as indicating where preventive measures are most needed and where prophylactic treatment should be made available.

For information regarding the disease, recourse has been had to state and territorial health authorities, including the District of Columbia; county and municipal authorities; the Bureau of the Census; Pasteur institutes, and press reports. Valuable assistance has been received through these agencies.

On account of the large number who furnished data, it is impossible to make personal mention, but acknowledgments are due and here made to all who contributed information, and whose cooperation rendered possible the collection of facts presented.

By making as careful inquiry as possible covering a certain limited period, it was thought that more definite information would be secured regarding the incidence of the disease. The facts collected and presented, therefore, relate only to the calendar year 1908.

TABLE 3.—RABIES IN THE UNITED STATES DURING 1908

State.	No. deaths in man.	No. localities in which rabid animals were reported.	State.	No. deaths in man.	No localities in which rabid animals were reported.
Alabama	1	13	Nevada	0	0
Arizona	1	1	New Hampshire	2	7
Arkansas	1	5	New Jersey ..	11	41
California ...	0	0	New York....	19	52
Colorado	0	1	New Mexico..	0	0
Connecticut .	1	7	North Carolina	0	19
Delaware	0	5	North Dakota.	0	2
District of Columbia ..	0	1	Ohio	4	32
Florida	0	11	Oklahoma ...	3	6
Georgia	3	17	Oregon	0	0
Idaho	0	0	Pennsylvania .	14	25
Illinois	2	18	Rhode Island.	1	10
Indiana	5	57	South Carolina	1	5
Iowa	1	5	South Dakota.	0	2
Kansas	2	4	Tennessee ...	1	7
Kentucky ...	1	7	Texas	3	15
Louisiana ...	4	3	Utah	0	0
Maine	0	0	Vermont	0	1
Maryland ...	6	12	Virginia	1	37
Massachusetts.	5	9	Washington .	0	0
Michigan	3	11	West Virginia.	0	2
Minnesota ...	2	18	Wisconsin ...	3	42
Mississippi ..	1	10	Wyoming	0	0
Missouri	8	9		111	534
Montana	0	0			
Nebraska	1	5			

Every effort has been made to include only authentic cases among human beings, and it is safe to say that no duplication of cases has occurred.

The same care has also been observed with respect to outbreaks among animals.

Table 3 contains the number of deaths reported among human beings in each state, and the number of localities in each state from which rabid animals were reported.

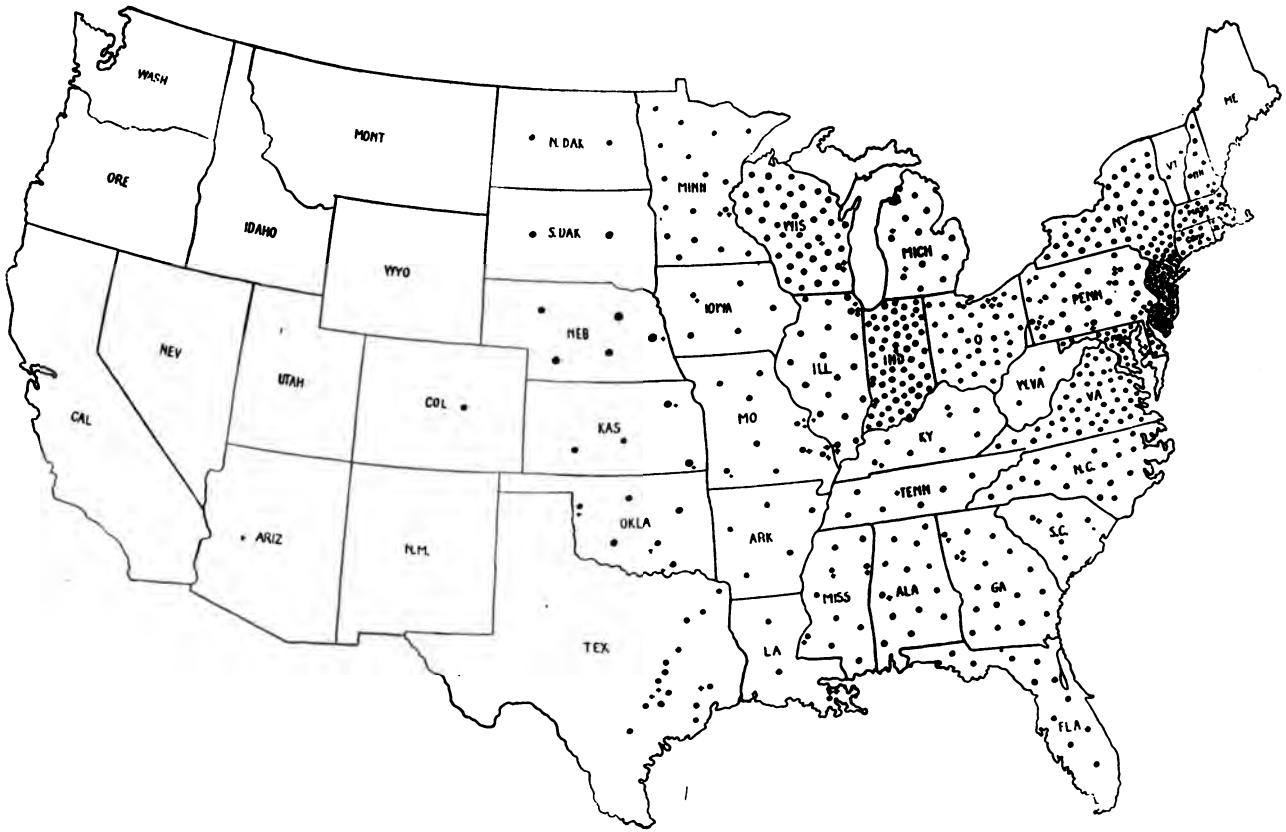
The accompanying map shows the reported deaths from rabies among human beings and outbreaks of the disease among animals.

There are 111 crosses, representing deaths, scattered over thirty states and territories. These crosses are placed as accurately as possible to show the exact location within the state where the infection occurred. This placing of the crosses was thought preferable for the purpose of this investigation to one in which the place of death would be indicated.

The dots represent 534 localities where rabies in animals was reported to have existed during 1908. They are not placed to represent the exact location of the disease, but indicate rather the number of places in each state where rabies existed. This arrangement was adopted in order to illustrate more strikingly the national prevalence of the disease. It is necessary to state in this connection that the apparent preponderance in certain states must be attributed in part to the receipt of more complete and detailed information from those sections.

In some states where comparatively meager data are indicated, a large number of rabid animals were reported, but the localities, not being mentioned, were necessarily omitted in order to avoid possible duplication.

The data presented represent foci of infection actually determined and not the number of cases among ani-



Map showing results of inquiry into the prevalence of rabies in the United States during 1908. The crosses represent human deaths, their position showing where infection occurred. The dots indicate towns, etc., where animals were reported infected, the position in state not being shown.

mals. The number of foci, however, would no doubt be greatly increased if complete reports from the various agricultural and veterinary institutions were at hand.

Practically all of the figures given, however, are compiled from official sources, representing 3,285 replies to inquiries sent out. Press clippings, on the other hand, furnished only a small proportion of the figures, and in no instance did a press report lack official confirmation. This is contrary to the general opinion that the cases reported in newspapers are usually without foundation.

The most striking feature brought out is the very general distribution of the disease throughout the Eastern portion of the country, and its almost complete absence from the extreme Western part, especially the Rocky Mountain and Pacific Coast regions. It must be remembered, however, that these sections, apparently free from rabies during 1908, have not always been exempt, cases having been reported by previous investigators from Montana, Colorado, California and Wyoming. The animals reported as having been affected were dogs, cats, wolves, horses, cattle, sheep, hogs, squirrels, and skunks.

It was among skunks that the disease was reported in Arizona, and the single death among human beings in that state followed the bite of one of these animals.

Dr. William Brumby, Health Officer of Texas, in a discussion of this subject at the Conference of State and Territorial Health Officers with the Public Health and Marine-Hospital Service, referred to the frequency of the disease also among skunks in western Texas and the dangers of the transmission of the disease through the agency of these animals.

Reports received from various sources indicate that a large number of laboratory diagnoses were made of the disease among animals during the year, but it was impossible to include many of these cases in determining the foci of infection for reasons previously mentioned.

FACILITIES FOR TREATMENT OF RABIES IN THE UNITED STATES

The reports thus far secured indicate that nearly 1,500 persons took the Pasteur treatment during 1908 on account of having been bitten by rabid, or supposedly rabid animals. On account of the futility of legal measures for the suppression of the disease, resort to prophylactic treatment to this extent was rendered necessary.

Pasteur treatment was no doubt a potent factor in the prevention of human deaths from this disease, but it must be regarded as a temporary and costly expedient to be maintained to save lives only until such time as more effective measures of attacking the disease at its root are being perfected and put in operation.

On inquiry, it has been ascertained that the Pasteur treatment is being given at present at the following institutions:

PASTEUR INSTITUTES, OR THEIR EQUIVALENTS, IN THE UNITED STATES

Montgomery, Ala.	Under State Board of Health.
Newark, Del.	Under State Board of Health.
Washington, D. C.	Hygienic Laboratory, Public Health and Marine-Hospital Service.
Jacksonville, Fla.	Under State Board of Health.
Atlanta, Ga.	Two institutions, one of them under the State Board of Health.
Chicago, Ill.	
Indianapolis, Ind.	Two institutions.
Iowa City, Iowa.	Under State Board of Health.
New Orleans, La.	
Baltimore, Md.	
Ann Arbor, Mich.	Under Board of Regents, State University.
Minneapolis, Minn.	Under State Board of Health.
St. Louis, Mo.	
New York City.	Two institutions, one of them under the municipal government.
Raleigh, N. C.	State Laboratory of Hygiene.
Pittsburg, Pa.	
Marietta, Pa.	
South Carolina.	One to be opened in July, 1909, under State Board of Health.
Austin, Tex.	Under State Board of Health.
Richmond, Va.	

There are thus over twenty institutions located in nineteeen states prepared to give Pasteur treatment, twelve of them being under official auspices.

VIRUS FURNISHED BY THE PUBLIC HEALTH AND MARINE-HOSPITAL SERVICE

Since April, 1908, the U. S. Public Health and Marine-Hospital Service has been treating, free of charge, exposed persons who applied at the Hygienic Laboratory, Washington, D. C. At the close of the calendar year, ninety-nine persons had availed themselves of the privilege. In addition, virus has been furnished to state health authorities on their request and for administration under their direction.

The treatment of persons at a distance from the laboratory by means of virus, forwarded when necessary under the system maintained, has proved entirely satisfactory. By this means a supply of virus is made available at all times, and especially to persons unable to secure it themselves because of financial limitations.

The treatments are shipped by mail in response to telegraphic request, and on arrival are both pure and potent. Slight delay in delivery has seemed to cause no appreciable decrease in potency, a considerable number of treatments having been sent to the Isthmian Canal Zone and used there with complete success.

The Pasteur treatment is undoubtedly a powerful factor in preventing mortality, but the necessity for it will be obviated when measures for the suppression of the disease among animals become effective.

That the extinction of rabies is a possibility is a matter of historical knowledge, as evidenced by the brilliant results of effective legislation in England and other countries.

The prevalence of rabies to the extent shown by this inquiry is evidence that further measures of suppression are necessary. It is pertinent in this connection to refer briefly to the measures authorized in certain states concerning which information is at hand.

In Connecticut a state law requires the registration and tagging of dogs and the destruction of dogs not registered and tagged. Local health officers are required

to report the occurrence of rabies to the Commissioner on Domestic Animals, who may make regulations to check the spread of the disease, such regulations to be published and obeyed under penalty of fine. A state law also provides for Pasteur treatment when necessary at state expense. On the oath of a physician that the treatment is necessary it is furnished at the expense of the town, the town being reimbursed from the state dog license moneys.

In Delaware, patients are treated by the State Board of Health at cost.

In the District of Columbia, the District Commissioners are required to issue a muzzling ordinance on the occurrence of rabies. Exposed persons are treated at the Hygienic Laboratory, Public Health and Marine-Hospital Service, on application, and treatments are mailed free, on application by state health authorities.

In Florida, the duty is placed by law on the State Board of Health to prevent the importation and spread of rabies. The Pasteur treatment is administered under the general statutes by the State Board of Health at the patient's home.

In Indiana, the state veterinarian is authorized to order the muzzling of dogs on the appearance of rabies.

In Maine, the state law empowers the State Board of Health to make regulations preventing the introduction and spread of rabies.

In Massachusetts, the powers to take measures are delegated to the Cattle Bureau, except in the City of Boston, where the Board of Health has this authority. A resolution recently approved in the legislature provides that the State Board of Health shall cause suitable provision to be made for the treatment of rabies in man by appropriate remedies, and shall report as to the expense and advisability of preparing these remedies under the direction of the State Board of Health.

In Michigan, the prevention of rabies is provided for in the law relating to diseases in cattle, and indigent

persons are treated at the expense of the township, city or village.

In Minnesota, by a regulation of the Sanitary Live Stock Board, a muzzling order may be issued by local boards of health where rabies exists. A state law provides for the free treatment of residents of the state, a special appropriation having been made for that purpose.

In New Hampshire, a law permits the local authorities to cause all dogs to be muzzled for such period as may be determined.

In New Jersey, laws provide for the issuance of a muzzling ordinance by the mayors of incorporated towns and the destruction of unmuzzled dogs; also for the notification to the State Board of Health of contagious or infectious diseases among animals, the investigation of reports by the board, and the taking of such precautionary measures as may be deemed necessary.

In New York, the restriction of the disease is placed under the control of the State Commissioner of Agriculture. A law provides that patients may be sent to New York for treatment at county expense.

In Rhode Island there is no state law controlling rabies. When the disease exists the local councils require the muzzling of dogs for a certain period.

In South Carolina, a law provides that the health officers shall, in case rabies exists, place restrictions to prevent its spread.

In Vermont, the public statutes empower the State Board of Health to make regulations to muzzle dogs when rabies is found, and to kill unmuzzled animals.

These serve to illustrate briefly the measures in use. A considerable number of states seem to have no provision for the institution of measures against rabies, while from others no data have as yet been received.

Notwithstanding the beneficent intent of these state laws and the good results to be expected of them, it is a matter of common observation that their enforcement

is too often, through neglect or inability to overcome the obstacles which always appear, more of a failure than an effectual application of suppressive measures.

SUMMARY

To summarize briefly the results of this inquiry, there were 111 deaths in human beings from hydrophobia reported from 30 states during the year 1908. Rabies was reported in the lower animals from at least 534 localities in 39 states and territories, including the District of Columbia. Evidence has also been secured of nearly 1,500 persons who, on account of exposure to rabies, or presumably rabid animals, were obliged to take the Pasteur treatment.

The disease is disseminated throughout the Eastern three-fourths of the country, and seems to have been unknown during the past year only in the Rocky Mountain and Pacific slope regions.

The suppression of rabies in man merely affords another instance of the necessity of eliminating a like disease from among animals.

This means the destruction of infected animals and the proper muzzling of all dogs in infected areas.

ABSTRACT OF DISCUSSION

DR. H. M. BRACKEN, St. Paul: I hope that Dr. Kerr will revise the map before it is published. It is not quite fair to Indiana that it should appear to be so much worse than all other states, some of which undoubtedly have as much rabies. Probably Minnesota would be as badly spotted as Indiana is if all the cases of rabies had been reported. In Minnesota the reporting is under two departments, the Live Stock Sanitary Board and the State Board of Health. This map illustrates what I have always maintained, viz., that it is a mistake to have two sanitary boards, one for animals and the other for humans. Under the present Minnesota law the State Board of Health has no interest in a rabid dog until it bites a human being. There is a Pasteur Institute in Minnesota, where during the past year over 200 human beings were given prophylactic treatment. All had been bitten by a rabid (or supposedly rabid) animal. In a few instances we were not able to get the head of the biting animal, and therefore could not prove rabies, but a large percentage of the individuals were shown

by the findings to have been bitten by rabid animals. I think the Minnesota State Live Stock Sanitary Board would be glad to furnish Dr. Kerr with the number of cases of rabies on its records, and I know that Dr. F. F. Wesbrook, director of the laboratories (and Pasteur Institute) will be glad to give data for the State Board of Health. I am glad to know that the material for prophylactic treatment put out by the United States Public Health and Marine-Hospital Service is to be sent only through boards of health. I do not think it is safe to put the prophylactic treatment for rabies in the hands of every physician in the country. Health officers know who the competent physicians are, and if a dog has bitten a person and prophylactic treatment is to be given, the health official is the proper one to determine who shall give the treatment. In Minnesota, when prophylactic treatment is necessary, this is given at the Pasteur Institute free of charge to residents of the state.

It may be interesting to know that in Minnesota the attorney general has given a ruling that the control of rabies comes under the same law as other communicable diseases, and, therefore, the expense connected therewith falls first on the municipality (city, village or township, as the case may be). The bitten person, if poor, does not have to stop and ask where the money to pay for traveling expenses, board, etc., is to come from. The local board of health sends the individual to the Pasteur Institute at once and the question of who shall pay the bills finally is determined.

DR. W. M. BRUMBY, Austin, Texas: I notice that very few cases have been reported from Texas, which I regret. So long as we have had so many cases, it is unfortunate that Dr. Kerr did not have the opportunity of making a better report possible from our state. The Pasteur Institute, however, is not under the state health department, but under the superintendent of one of the insane asylums. As many as 1,350 cases of hydrophobia have been treated at that institution in a little less than the last five years, with 6 deaths. The patients who died were invariably bitten fearfully, lacerated or macerated, many bitten as frequently as from 25 to 50 times, if I am not mistaken; 5 or 6 were children. At our institution the officials prepare their own specimens, and have been very fortunate in their work; very few instances of any septic trouble resulting are known. There is a uniform charge of $25 in each case—each patient treated; unless, of course, the patient is in needy circumstances, when no charge is made.

In 75 per cent. of the cases the individuals were bitten by skunks. There is more hydrophobia in west Texas, Arizona and New Mexico, apparently, in proportion to population, than east of that point. It is asserted that a certain skunk is very susceptible to this disease and it is known as a "hydrophobia cat." These animals have rabies and die with it. About 2

or 3 per cent., possibly, of the patients bitten, were bitten by wolves. Our institution at present has 27 or 28 rabies patients in it, and has had constantly, for the last twelve months, from 22 to 32 cases at a time. I forgot to get the exact number of cases treated last year; but I am pretty sure that there were about 400 such patients treated in the last 12 months in Texas, 80 per cent. of which were from the state of Texas. Others came from Mexico, New Mexico, Arizona and Louisiana.

DR. JOHN F. ANDERSON, U. S. Public Health and Marine-Hospital Service: It has been decided that in the lack of any special arrangements it was not wise to send out the emulsion ready for use; although that is done by some of the commercial firms, who send it out in a modified thermos apparatus. We sent out our cords, each treatment being in a separate glass vial. This is sent out to the state health laboratory, with full directions showing how the emulsion should be prepared, and stating the scheme of treatment—either mild or intensive. We have adopted the Berlin scheme; that is, the most attenuated cord we use is the one dried 8 days; whereas, in the Pasteur method, the 14-day cord was used in the beginning. In the Pasteur method, the 2-day cord is only reached at the end of 7 days; we reach it in 4 days; and in the intensive treatment the 1-day cord, which is given only once, is reached on the fifth or sixth day. It is interesting that Ferran in Barcelona has reported some good statistics in which he uses the fresh cord from the rabbit; so, after all, we may be losing a good deal of time in drying our cord and not taking it immediately from the rabbit.

DR. W. FORREST DUTTON, Walker's Mills, Pa.: Within the last few months there have been 25 or 30 cases of rabies in western Pennsylvania. I do not know what is ascribed as the cause; the disease seems to me to be increasing at a rapid rate. There is an efficient Pasteur institute in Pittsburg, but it does not seem to affect the increase in the rate at all. I do not know whether it is the fault of the authorities or some unseen thing that we have to deal with.

DR. M. F. GATES, U. S. Navy: Have any experiments been undertaken at the Hygienic Laboratory or elsewhere, with a view of determining whether or not there is any persistent infection in animals or men apparently cured or recovered from rabies, and to ascertain whether it is possible to redevelop a virulent virus from these cases? It seems to me that, in view of the tendency toward the injection of sera containing living organisms, this is an important point.

DR. JOHN W. KERR, Washington, D. C.: I shall be glad to revise the map to date if anybody will be kind enough to furnish additional information of definite location where rabies was found in 1908. To secure the data presented, over 7,000 inquiries were sent out, and in some instances we have re-

ceived duplicate reports. In order to avoid misrepresenting a particular state or locality, therefore, we have had to exercise great care, and probably have had a few more reports of infected localities than are shown on our map.

Rabies is a striking disease because of the method of its transmission and uniform fatality. On this account, and on account of the relatively few cases that occur, one would suppose it to be, and it probably is, the easiest disease concerning which to get accurate information. I assure you, however, that a collection of definite data of this disease has been extremely difficult to secure, and this only represents the great difficulty of collecting morbidity and mortality statistics for the entire United States.

Dr. Stimson, my associate in this work, has had entire charge of preparing the virus, and he has made a special study of it, whereas my part of the work has been in connection with the collection of the statistics.

DR. J. N. HURTY, Indianapolis: Indiana is very well spotted on the map. The reports come in very promptly since we had a symposium on the subject of hydrophobia in our health officers' school, which is held whenever the state board commands. We tried to get a law that would prevent hydrophobia. The idea was to place a heavy tax so as to get rid of all miserable curs, and then only the well-bred, well-cared-for animals would be kept. The bill failed to pass. At Bloomington, Ind., where the state university is located, and where there are from 2,000 to 3,000 students, it was found that in each fraternity house there were from 2 to 4 bulldogs. In one "frat" house a bulldog went mad and infected 21 boys. They all took the Pasteur treatment, and none of them had the disease. With all this horrible experience, the people can not be brought to the point of handling the dogs so as to prevent hydrophobia. I do not know that we can attribute it to stupidity. The people there are students of science and the college has a highly cultured faculty; and yet they will not take steps toward controlling the dogs, the source of the hydrophobia. When we consider educating people in preventive medicine, this experience is rather discouraging. Our statistics show that 3 per cent. of the cases of hydrophobia reported proceeded from cats. Cats and dogs only. We have no record of any other animals imparting hydrophobia.

One of the deaths at Indianapolis occurred eleven months after incubation. A woman's pet dog bit her; the dog afterward died of some disease not known—it may have been hydrophobia; and then the woman developed hydrophobia and died. The physicians who attended (I did not see the case) are confident that it was hydrophobia.

DR. M. FREDERICK, Cleveland: We had an epidemic of rabies in Cleveland, so much so that at the present time every dog that bites is placed under the care of a veterinary surgeon at

the owner's cost. The city treats every person bitten by a rabid dog free of charge. They are not guarded in an institution. They are allowed to go about their business. Any intelligent physician can administer the treatment. There is no need of sending these people hundreds of miles over the country. A physician who can inject antidiphtheritic serum can also inject antirabic serum.

DR. W. LITTERER, Nashville, Tenn.: Prior to 1900, rabies was a very rare disease in Tennessee. Since that time it has been progressively increasing, until now there are reported more than 100 cases occurring every year in dogs alone. I am sure I could put on the chart 100 dots as well as 3 crosses. One case occurred in Nashville; the patient died recently from typical rabies. I made an autopsy and found the Negri bodies in the cerebellum, in the hippocampus major and in other parts of the brain. A portion of the brain was emulsified and subdural injections made in 3 rabbits and 3 guinea-pigs; they all died from rabies in from 15 to 21 days. The pigs died sooner than the rabbits. When one studies this disease carefully, I am at a loss to know how anyone can doubt its existence. I want to call attention to the prevailing idea, especially among negroes and uneducated whites in my section of the country, concerning the therapeutic value of the madstone when one has been bitten by a rabid animal. The madstone is said to be an enterolith from the deer and is applied to the wound. Owing to its porosity it will stick and when put into milk it is said to turn the milk green. This performance is impressive to many of the lower classes and a number resort to this mode of treatment. I wish to say that such a practice is pernicious. In the first place, it creates in the mind a false security, and secondly, I have in mind a case in which the madstone actually produced the disease. It occurred after the following manner: A man was bitten on the hand by a rabid dog and a madstone applied; several hours later a vicious bulldog (not rabid) bit a 5-year-old child severely on the cheek. The same madstone was applied to the cheek of the child. In twenty-two days the child died from typical hydrophobia. No autopsy was allowed. The bulldog is living to-day, showing that the disease could not have been transmitted by it, but that the only means of transmission was by carrying the virus from one person to another by means of this madstone. As I said before, such a practice is pernicious and should be controlled by legislation.

DR. A. C. ABBOTT, Philadelphia: From a limited experience with this disease in Philadelphia, I am convinced that the suggestions of Dr. Friedrich of Cleveland are both important and practical. The value of the treatment is no longer under debate. The time at which the treatment should be given is of immense importance. To waste time in discussing how the means are to be raised for a patient bitten by a rabid animal

to go to a Pasteur institute, is, in my opinion, not justifiable. I do not think we should pause to determine who is to pay for this treatment. If the community wants to get rid of the disease and save the patient, it can fairly have the cost of this treatment charged up against it.

The plan that we have followed in Philadelphia in a small number of cases—some of which were certainly hydrophobic, some of which were doubtful in my mind, but which I considered of sufficient gravity to give the patient the benefit of the doubt—has been this: We have secured, at the expense of the health department of the city, materials from reliable laboratories (usually from the New York laboratory), and have detailed one of the physicians of the health department to administer the treatment. We have not had a single death in a number of cases, how many I can not state precisely, but probably twelve would cover them all. They were among people who could not have raised the means to go to New York and remain there long enough to get the treatment; and had they not received the treatment in the way given by us, they would not have received it at all; and I am convinced that there would have been some fatalities. As it was, there was no fatality. We pay $25 for material enough to treat a single case. I do not know the terms under which the emulsion can be secured from the government laboratory.

DR. H. M. BRACKEN: It is free.

DR. A. C. ABBOTT: I feel, therefore, that it is advisable for those in authority to keep a small supply of this material on hand for emergencies. There is no difficulty whatever about the injection; and so far as the results of the injection are concerned, as Dr. Friedrich says of the Cleveland experience, we had no more bad results than one would get from the injection of antitoxin for diphtheria.

DR. JUAN GUITERAS, Havana, Cuba: This disease also extends to Cuba. We had been several years without any cases of rabies until last year, when there was a remarkable increase; and there was just as remarkable a falling off after the law in regard to street dogs was put in force. The disease is now rapidly dying out. We have a Pasteur institute there; and the patients receive the treatment with great success.

THE FRENCH GOVERNMENT TOBACCO FACTORY AT ISSY, NEAR PARIS

HYGIENIC NOTES

FRANCIS DOWLING, M.D.
Foreign Member of the Société Française d'hygiène
CINCINNATI

While in Paris, France, during the summer of 1908, for the purpose of making some investigations in the department of hygiene, I received permission to visit the government tobacco factory at Issy les Moulineaux, near Paris.

I wanted to make some investigations in regard to the effects of tobacco on the eyes of the employés of the factory, along the line of similar investigation which I have made in the tobacco factories of America, but this permission was not granted; I was permitted, however, to examine into the sanitary condition of the establishment, and was afforded every opportunity in this direction by the courteous director of the factory. The following are some of my findings:

The large tobacco factory, situated at Issy les Moulineaux, a short distance beyond the fortifications of Paris, covers several acres of ground, and is about the largest factory of its kind in France. It employs 1,200 persons, of whom 1,000 are women and 200 are men. The structure is an immense one, built of stone and brick, and was finished in 1904, when the old establishment in Paris was removed to this location. It is up to date in all its appointments, has the latest modern machinery, and turns out only cigars, cigarettes, and

tobacco for pipes. In the first division the machinery is all of French make. It turns out cigars and tobacco for pipes. There are some very ingenious machines there for compressing and packing tobacco into forty-gram packages (a little over an ounce). A machine will turn out 1,300 of these packages in an hour.

All the floors contain cuspidors with a disinfectant substance, and the rooms are kept scrupulously clean. In one room there is some American machinery that is made in London and Dresden. All the tobacco dust from the machines is conducted through pipes to a flue and escapes through a chimney in the roof, and in this way very little dust is to be found in the work-rooms, and there is comparatively little smell of tobacco. There are twelve large work-rooms in the establishment, each 40 meters long and 14 meters (about 130 by 45 feet) wide, with immense high ceilings. Besides these there are smaller work-rooms. The men are employed largely to do the heavy work, while most of the skilled work in turning out cigars and cigarettes is done by the women. The superintendent informed me that the women are more dextrous in the use of their fingers than the men, and hence are given the preference in this kind of work. I found some Cincinnati machinery in one of the rooms for turning out cigarettes. This room was called the American room.

Besides the rooms for French tobacco there is a large room devoted to American tobacco, labeled "Ohio," "Maryland," "Kentucky," etc. The colors of these grades of tobacco are about twelve in number. Each woman employed in packing the cigars in boxes has her number on the box, so that in case the boxes are not packed properly the superintendent can tell who is at fault. Most of the employés go home for dinner at noon; for those who remain there is a pantry and kitchen for warming their food. There is a library in the establishment, baths, an emergency hospital for those who may be injured, and a dispensary with a full supply of

drugs for the factory doctor who visits the establishment daily. All the water used for drinking purposes is sterilized by machinery. There is a good-sized nursery (crèche) for the babies that the working women may bring with them, with a kitchen for preparing food, bath-tubs, closets for toilet, etc.

The majority of the women here were much more mature-looking in appearance than those I saw in the factories in America. I saw no very young girls, and, of course, no boys. Smoking is against the rules in the establishment. The women did not present the anemic appearance that one notices among those employed in our American tobacco factories. The men showed no symptoms of tobacco infection that I could discern; and the medical director says that tobacco amblyopia rarely occurs among them. They do not smoke to the extent that our American workmen do, and, then, the cigars are lighter, and a good many cigarettes are used instead of the heavy cigars that our people smoke.

The sanitary condition of this factory is as good as that of any that I have ever visited. There was no crowding in the rooms; there was plenty of breathing space, and the employés all looked healthy.

All the tobacco factories are government property, and they yield an enormous revenue. For the year 1907 the total number of employés in the tobacco manufactories of France was 15,171; of this number, 13,239 were females and 1,932 were males. There are twenty of these manufactories in France situated in the following cities: Bordeaux, Châteauroux, Dieppe, Havre, Le-Mans, Lille, Limoges, Lyons, Marseilles, Morlaix, Nancy, Nantes, Nice, Orleans, Pantin, Issy les Moulineaux, Reuilly, Riom, Tonneins and Toulouse. All the employés, both men and women, are eligible for retirement at the age of sixty-five, when they are pensioned by the government. By a law of March 22, 1905, the male employés are appointed from the soldiers who have served for at least four years under the French

flag; consequently they are at least twenty-five years of age before they are employed in the factories. Foreigners are not employed in these factories; occasionally, however, exceptions are made, and foreigners are appointed; especially in the case of French women who marry foreigners, for the women thence by virtue of such marriages become foreigners, according to the French law. If they are employed before such marriages, they are retained in the factories under the classification of foreign employés. These marriages occur mostly at Nice, Toulouse, etc., the seaport towns of France. Women are not employed if they are beyond twenty-eight years of age, and practically the minimum age is eighteen years. That disgusting practice of chewing tobacco, too prevalent among our Americans, does not exist among Frenchmen.

A medical director who resides in Paris is at the head of the medical department of these tobacco factories, as well as the other factories of the state. There are local physicians attached to the various factories, whose duty it is to look after the hygienic condition of the institution, as well as to care for any of the employés who may be injured while on duty. These physicians are all under the supervision of the medical director at Paris.

As will be seen, there are no minors employed in these French tobacco factories. This is as it should be. They should also be excluded from our tobacco factories in America, and for this purpose we should have government supervision of our tobacco factories so as to have uniform laws enacted forbidding their employment. As it is now, each state makes its own laws governing the matter, and they are not uniform and very often they are not enforced. I know that in my city there are a large number of boys and girls employed in these factories, and I suppose it is the same in the tobacco factories of other cities. They are employed on the score of cheapness, as they command less wages than the adult. In my investigations made in our fac-

tories I found that nearly all of the boys employed there smoked to a greater or less extent. The environment of the factory seemed to stimulate this habit.

In the minor the use of tobacco in any form is highly injurious, interfering with the normal development of the mental powers, producing various nervous disturbances, especially nervous disturbances of the heart, as manifested by palpitation, weakness, irregular action, irritability and anginal pains.

The action of tobacco on the heart is well set forth in the Lettsomian Lecture by J. Mitchell Bruce:[1]

> In young men whose circulation is still structurally sound, the uncomplicated effects of tobacco, as presented clinically are palpitation in every instance; a sense of irregular action, poststernal oppression and pain in half the cases; and in one out of every eight either angina or uncomfortable sensations in the left arm; faintness or actual faints in one-third of the cases; giddiness and a feeling of impending death in a smaller proportion. As to physical signs, the heart proves of ordinary size in 50 per cent. of the cases, in a few slightly enlarged; the precordial impulse is very weak, but occasionally increased in force and frequently, and likely as not to be irregular; the pulse tension, with insignificant exceptions, is low. Of twenty patients, not one presented a cardiac murmur beyond a weak mitral systolic bruit, variable with posture and cubitus.

That the habitual use of the tobacco by the young causes stunting of the physical and mental growth is set forth in the observations of Seavers, of Yale University, who has for years studied the growth of students during their four years' time at the university. He observed that those who do not use tobacco increase in weight, height, chest girth and lung capacity more than those who do use it. He states that Hitchcock, of Amherst, has made like observations.

On those who are more advanced in life, from forty upward, tobacco seems to spend its force more particularly on the eyes, producing a gradual but progressive reduction of the visual power, together with a confound-

1. Bruce, J. M.: Brit. Med. Jour., March 23, 1901.

ing of colors for central vision. Out of something like 3,000 cases examined by me, during a period of ten years, in the tobacco factories of Cincinnati, more or less disturbance was noticed in about 5 per cent. of the cases among the male employés who used tobacco to excess. The females were exempt.

The deleterious effects of tobacco on the system in general, or on the eyes, is due, as we all know, to the presence of a poisonous ingredient called nicotine. This oily, colorless fluid diffuses itself into the blood with as much rapidity as prussic acid, and a poisonous dose has been known to kill an adult in three minutes. Nicotine when heated to 250 degrees becomes volatilized and decomposed, but if watery vapor is present volatilization takes place without decomposition. When dry tobacco is smoked, the greater part of the nicotine is decomposed by the heat and passes off with the smoke. The more moist the tobacco—and the cheaper grades are usually damp—the more this is retarded. The cheaper grades of tobacco contain more nicotine than the more expensive ones, and consequently are more injurious to the consumers. The tobacco used for chewing purposes is usually very rich in nicotine. The action of nicotine on the blood is an interesting one; it first produces a temporary increase in the blood pressure; this is followed by a more prolonged reduction of the pressure, and this again is followed by an increase in the blood pressure (Tschirwinsky).

On the blood corpuscles themselves nicotine exerts a marked influence. The red corpuscles become serrated in appearance, and when the drug is administered in large doses partial disintegration of the corpuscles takes place. In the experiment of Hare they are shown to arrange themselves in columns, instead of in rouleaux, in such a way that the edge of one corpuscle touches the edge of its neighbor. If the poison is added to the specimen under the microscope, the red corpuscles appear to disintegrate, and their diameter becomes smaller,

whereby for the most part their concavity is diminished and they become colorless and transparent. Vas has shown that in chronic tobacco-poisoning the number of red corpuscles is reduced, whereas the number of white corpuscles is increased. The action of the poison is particularly marked on the white corpuscles. Their motion, which on the artificially warmed slide continues, is, as the Hare experiments show, immediately retarded by the addition of nicotine; the blood corpuscle, on its part, breaks up into eight or more divisions, which from time to time separate and swim in the fluid independently of each other. These divisions are round in appearance and bear a strong resemblance to the red corpuscles. The globular shape which the white corpuscles often assume does not appear after the addition of nicotine, but the protoplasm remains without change in the condition in which it appeared when motion was suspended.

Nicotine exerts a direct action on the oxyhemoglobin, and it is probable that it is in the reduction of the latter that nicotine acts as a causative agent in the production of asphyxia. The disintegration of the red corpuscles described above points to the correctness of this conclusion; therefore, death following nicotine poisoning is not simply in consequence of the usual asphyxia from depression of the respiratory center *per se,* but is due to the fact that the hemoglobin fails to carry oxygen to the various parts of the body.

124 West Ninth Street.

ABSTRACT OF DISCUSSION

DR. W. FORREST DUTTON, Walker's Mills, Pa.: I have used the Riva Rocci instrument a good deal in recording these cases. I have not examined a large number, but I have examined enough to know that smoking, as a rule, raises blood-pressure and keeps it high for a considerable time. It would seem to me that the men and women working in a tobacco factory side by side would be affected in the same way; but this paper states that the men were affected by this particular eye affection and the women were not affected. I should

like to have some explanation of that phenomenon for my own edification.

DR. FRANCIS DOWLING, Cincinnati: I found, in my examinations in the tobacco factories, that the air of the factories does not produce either a toxic infection of the eyes or of the system in general of the employés. It was only in those who used tobacco in smoking or chewing that toxic symptoms were manifested. The reason the women are exempt is that they do not usually smoke or chew tobacco. I found that some of the men, on the other hand, smoked as many as 18 or 20 cigars a day, and the degree of tobacco infection, especially of the eyes, was usually proportionate to the amount of tobacco consumed.

A NEW TYPE OF PHTHISIOPHOBIA

S. ADOLPHUS KNOPF, M.D.

Professor of Phthisiotherapy at the New York Post-Graduate Medical School and Hospital; Associate Director of the Clinic for Pulmonary Diseases of the Health Department; Attending Physician to the Riverside Hospital Sanatorium for the Consumptive Poor of the City of New York

NEW YORK

In these twenty years of work in tuberculosis and with the tuberculous, I have come across a good many types of phthisiophobia. There is, first, the general phthisiophobia, that is to say, the exaggerated fear on the part of the layman of the presence of the consumptive. All physicians who have had anything to do with tuberculosis have seen this type of phthisiophobia. Then there is a phthisiophobia of communities which object to the establishment of sanatoria, tuberculosis dispensaries, day-camps, or even open-air schools. Nearly all our state commissions which have been entrusted with the establishment of sanatoria, have encountered this phthisiophobia, which has its origin in the fear that a sanitary or financial danger may arise to the neighborhood wherein such an institution should be established. In my books and articles[1] I have protested against this type of phthisiophobia more than once and have been able to demonstrate conclusively by statistics that the mortality from tuberculosis among the inhabitants in or

1. Tuberculosis, Its Modern Prophylaxis and the Treatment in Special Institutions and at Home, P. Blakiston's Son & Co., Philadelphia; Tuberculosis, in Twentieth Century Practice of Medicine, xx and xxi, Wm. Wood & Co., New York; Tuberculosis as a Disease of the Masses and How to Combat It, The Survey, New York; Public Measures in the Prevention of Tuberculosis, in American Treatise on Tuberculosis, D. Appleton & Co., New York; Tuberculosis a Preventable and Curable Disease, Moffat Yard & Co., New York.

near communities where sanatoria have been established has always decreased after the opening of the institution, and continued to decrease.[2] Furthermore, the financial prosperity of the community has been improved as compared with what it was before the establishment of the sanatoria in such localities.

Heretofore, phthisiophobia usually originated in the minds of laymen, although some years ago a young physician,[3] first quoting a number of other authors and then stating his own experience, denounced the average consumptive as having mental peculiarities which manifest themselves in psychasthenia, the loss of self-control, the rise of brute selfishness, all combining to distort the clearness of ethical perception. It was not very difficult to reply to this unjust, totally unwarranted, and unscientific accusation.[4] The best men in our profession came to my assistance. Such men as Osler, Biggs, Janeway, Trudeau, Otis, Tyson, and others gave the benefit of their experience, all showing conclusively that the average consumptive, far from being below the usual moral standard, more often has a higher ethical and humane conception of his duties toward his fellowmen.

Therefore, it was with a genuine feeling of sadness that I read in the *Survey* (New York) of May 22 and in various Oklahoma newspapers that the State Board of Medical Examiners of Oklahoma recently decided to refuse granting licenses to practice medicine to all physicians afflicted with tuberculosis. To justify their position it was held by the board that the interests of the patients demanded this action.

I confess that in all my experience with phthisiophobics I have never heard of such an inhuman, cruel decision. How often has it not been proved that the clean, conscientious, and trained consumptive is not a danger

2. The Sanatorium for Tuberculous Patients, Its Medical and Social Mission, New York Med. Jour., Oct. 21, 1905.

3. Saxe, G. A. De Santos: Psychical Relation of Tuberculosis in Facts and Fiction, New York Med. Jour., Aug. 1 and 8, 1903.

4. A Plea for Justice to the Consumptive, Med. Rec., New York, Jan. 2, 1904.

to his fellowmen, but is as safe to associate with as anybody else! Who in the world, in the name of justice and fair play, can be better trained, more careful, or conscientious than the physician who is afflicted with tuberculosis? I have had as internes in one of the great German sanatoria, and in later years as private patients, a goodly number of consumptive physicians, and, while I am willing to concede that they were by no means model patients when it came to resting when they ought to have rested, not once can I recall an instance when they were not scrupulously clean and careful with their expectoration, and in their general behavior the last persons who could propagate the disease.

Last, but not least, what would be our medical science of to-day, where our modern therapy of tuberculosis without the tuberculous physicians—a Laennec, a Brehmer, a Dettweiler, a Grancher, a Solly, a Trudeau, or the hundred others who, because they were tuberculous, devoted or are devoting their lives to saving others from falling victims to the same disease? Laennec taught us to auscultate the tuberculous chest; Brehmer founded the first sanatorium for the tuberculous in Germany and proved more than anybody else the curability of tuberculosis when he defended his celebrated thesis, *Tuberculosis primis in stadiis semper curabilis* (tuberculosis is always curable in its first stages). His most illustrious pupil, Geheimrath Dettweiler, my own immortal teacher, who elaborated on Brehmer's system by adding the rest cure, realizing the need of the greatest precautionary measures in sanatoria, invented the first pocket flask as a receptacle for tuberculous sputum. Anxious to let the masses also be benefited by the invaluable sanatorium treatment, he became the founder of the first sanatorium for the consumptive poor in Germany. And Grancher, one of my French masters, how much are we not indebted to him for proving the pathologic unity of tuberculosis long before Koch's discovery of the bacillus! How much do we not owe him for his clinical de-

scription of incipient tuberculosis, and what a beautiful example of brotherly love did he not exemplify when, though childless himself, he created and endowed the work of preserving children against tuberculosis (*œuvre de la preservation des enfants tuberculeux*).

Solly, a consumptive English physician, sought and found in hospitable Colorado and among the fraternal members of the medical profession of Colorado Springs a welcome and a home. He became an American and added glory to the American medical profession by his antituberculosis labors and climatologic studies. His book on climatology is one of the classic productions of the day on this subject.

I name our own Trudeau last, not that he is the least, but perhaps the greatest of them all, for if there ever was a tuberculous physician who typified all that is best in man and in our profession surely he is the one. Twenty-five years ago he arrived, a tuberculous invalid, in the Adirondack wilderness. He was not content to cure himself, but immediately set about to help others, and by hard work and study and with a heart for suffering humanity he has become one of the greatest authorities in the therapy of tuberculosis and the pioneer in the sanatorium treatment in the United States. Thanks to his indefatigable labors there exists to-day at Trudeau, the place named after its founder, one of the most flourishing and beautiful sanatoria, comprising over twenty cottages, infirmary, administration building, church, library, laboratory, etc.

I have named only six of our great therapeutists and antituberculosis workers who, though themselves tuberculous, saved, by their devotion to the cause, by their labor for science and love for humanity, thousands and thousands of consumptive sufferers who without their skill would have been doomed. But what would the places be where these men chose to reside had they not been made famous by the cures wrought by these tuberculous men of science? It was Brehmer who gave the

reputation to Goerbersdorf and made of the sleepy village a prosperous town. Dettweiler did the same for Falkenstein. Solly added to the reputation of Colorado Springs, and Grancher to that of Pau, in the Pyrenees, while Saranac Lake, now one of our greatest American health resorts, certainly owes its prosperity to Trudeau.

But what we are most concerned with is not the economic but the purely humane and scientific consideration of Oklahoma's attitude toward tuberculous physicians. Scientifically, the decision of the Oklahoma State Board of Medical Examiners can not stand the test. Tuberculosis is the most prevalent of all diseases, and it has been demonstrated at the autopsy table that almost all of us either have or have had a little tuberculosis at some time or other in our lives. Physicians are not exempt from the disease, and many a one would have to lay down arms and retire should this cruel law of Oklahoma become universal.

And now one more word as to the humane consideration. The majority of tuberculous physicians were well and strong when they entered the profession of the healing art. When they contracted tuberculosis they contracted it in the performance of their duty. In my own life I can count, indeed, altogether too many whom I know became consumptive from overwork and exposure to infection. They had taken tuberculosis from others, but I know they have never given it. They have saved many lives and effaced centers of infection, but never became themselves a source of infection. To reward these men by excluding them from practice, by excluding them from any locality where they may recuperate, do good to others and support their own families, is the most cruel and most inhumane action conceivable by one physician toward another.

The medical profession of the State of Oklahoma can not afford to have the distinction of having created a new kind of phthisiophobia which is cruel, unkind, unjust, and certainly not fraternal. The authorities of

that great state can not afford to have the unique stigma of inhumanity and selfishness, not to say lack of wisdom, attached to the fair name of Oklahoma. If the medical board of that state should maintain its attitude, I would consider it a reflection on the medical profession of the whole United States. And it is in the hope that the Oklahoma State Board of Medical Examiners may be induced to reconsider this decision by learning the sentiment of the American medical profession at large on the subject that I ask this Section to adopt resolutions,* for recommendation to the House of Delegates.

16 West Ninety-fifth Street.

*EDITOR'S NOTE: Dr. Knopf's resolutions set forth that the clean, conscientious, and trained consumptive is not a menace to his fellowmen, and that the scientific knowledge of tuberculosis has been vastly increased by physicians of the past and present who have been afflicted with tuberculosis; and expressed the regret of the Section at the action of the Oklahoma board and the wish that the restriction be withdrawn. The resolutions were referred by the Section to the House of Delegates, which body referred them to the Reference Committee on Hygiene and Sanitary Science, but no report was returned from that committee, so no action was taken by the House.

INSECT CARRIERS OF TYPHOID FEVER

W. FOREST DUTTON, M.D.
PITTSBURG, PA.

The events brought about by the Spanish-American war marked the beginning of the greatest epoch in the history of preventive medicine in America. The arrest of the growth and propagation of certain mosquitoes—anopheles, culex, and stegomyia—has blazed the way for the greatest achievements of modern times.

FLIES

Insect carriers of disease have not, until a comparatively recent date, received any impressive attention from medical observers. The mosquito was, perhaps, the first insect to receive due attention. Its importance as a host in malaria, yellow fever, and other diseases has been thoroughly established.

The common house-fly (*Musca domestica*), since time immemorial, has been a common nuisance of all countries, civilized and uncivilized. My first observations of the house-fly as a carrier of disease were made in army camps during the Spanish-American war. It is well known that the army camps of this war were veritable hotbeds of typhoid fever. Some outbreaks could be readily traced to the water-supply; in other camps, where the water was free from contamination, the cause of the spread of typhoid was at that time unknown. Other observers (Veeder, Craig, Austen, Stalham, Oldham) have connected the fly with the transmission of typhoid in army camps.

While stationed at Tampa, Fla., in the early summer of 1898, I observed that the larger outbreaks of typhoid took place and spread in the direction of the prevailing wind. I did not fathom this peculiar phenomenon until Sergeant Brady was stricken with typhoid fever at Fernandina, Fla., some months later. He mentioned to me that the lime used about the latrines and garbage dumps

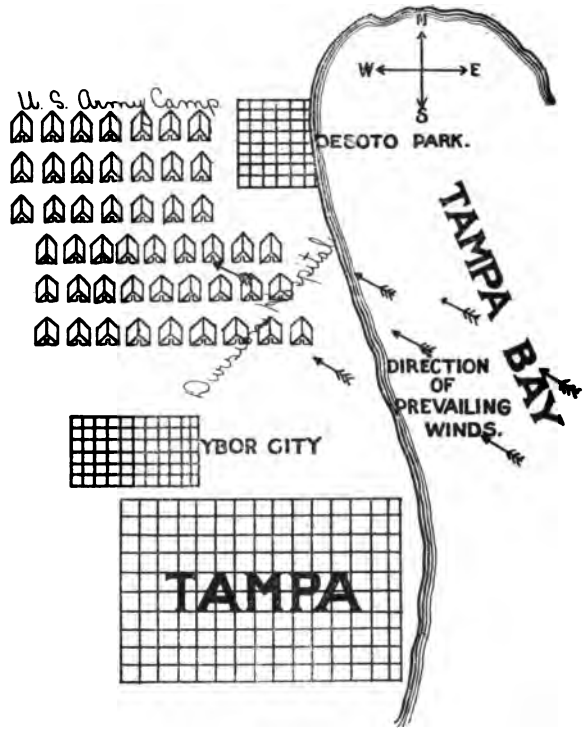


Fig. 1.—Map showing the location of part of the U. S. Army camp at Tampa, Fla., July, 1898. The arrows show the general direction of the prevailing wind and indicate how infected flies were carried from hospital, latrines, etc., to other parts of the camp.

was carried by flies to the food which we were using. After investigation, I found that the flies did not only carry lime, infectious matter, and other foreign material, but that they traveled in the direction of the prevailing wind.

Dr. Thomas S. Anderson, of Pittsburg, has recently confirmed and observed the factor of the prevailing wind in the spread of typhoid. In a symposium on typhoid fever before the Allegheny County Medical So-

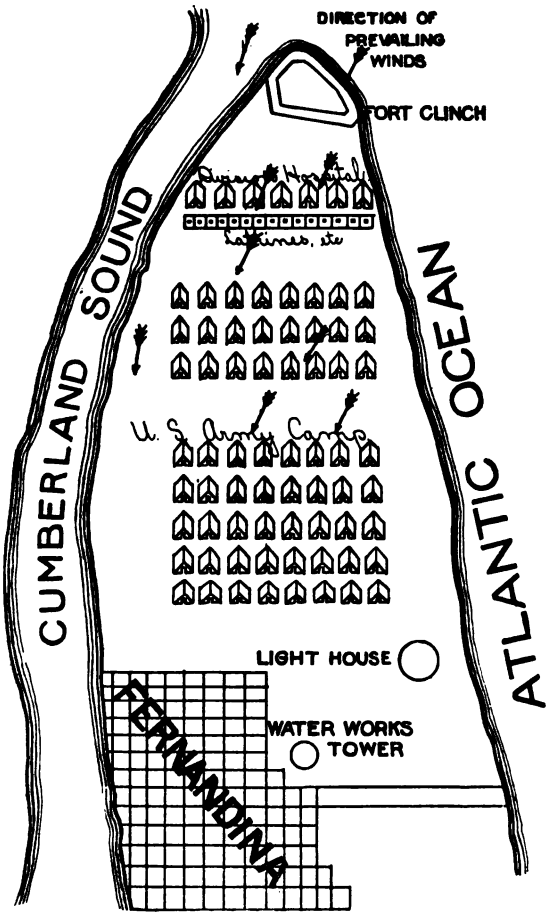


Fig. 2.—Map showing the location of the U. S. Army camp at Fernandina, Fla., 1898. The arrows show the directions of the prevailing winds and indicate the direction flies were carried from infected sources to different parts of the camp.

ciety, Pittsburg, Pa., held April 20, 1909, Dr. J. F. Edwards, superintendent of the Bureau of Health, said

that with the many open box privy vaults in the densely populated parts of the city the possibility of flies as carriers of disease might be a factor, but that his department had no knowledge that such was the case. Pittsburg until recently had one of the largest typhoid mortality rates of any municipality in the world. Thus, one notes how easy it is to overlook some of the most important factors in the transmission of typhoid.

According to the investigations of Dr. Hamer, of the London County Council, the most productive of all factors in the fly genesis are accumulations of horse manure, but collections of dust and other refuse act as breeding-grounds. He states further that children, dirty walls and ceilings, particles of food on the floor and in sinks, are influential in attracting flies.

It has been shown that flies may carry typhoid fever germs in a living condition for over two weeks. Experiments have shown that typhoid bacilli may pass through the intestinal tract of the fly and remain alive. The germ is not so readily carried in the body of the fly as on its hairy feet. The urinals, linen, and even the mouth and rectum, as seen in many army camps, are places most likely for the fly to frequent, and thus pick up germs and become a most potent medium for the dissemination of the disease.

The true or common house-fly (*Musca domestica*) commonly lays its eggs on horse manure (its favorite food), cow manure, human excrement, and decaying animal and vegetable material. Howard has found that in midsummer each female lays 120 eggs, which hatch in eight hours, the larval period lasting five days, making the total time for the development of the generation ten days. This was at the end of June in Washington, D. C. The periods of development vary with the climate, season, and food. In the climate of Washington there is ample time for the development of twelve generations every summer (Howard).

Pomace-flies, or little fruit-flies, are commonly seen about decaying fruit and other decaying vegetation (Howard). The most abundant and widespread species is *Drosophila ampelophila,* the vine-loving pomace-fly (Kellogg). These flies are frequently found feeding on table fruits such as pears, peaches, plums, grapes, and apples. Fruit furnishes both food and a place for oviposition for these insects. Kellogg has observed: "The larvæ or maggots hatch in three to five days, live in the fruit four days, and lie in the pupal stage three to five days, so that the life cycle is gone through in less than two weeks."

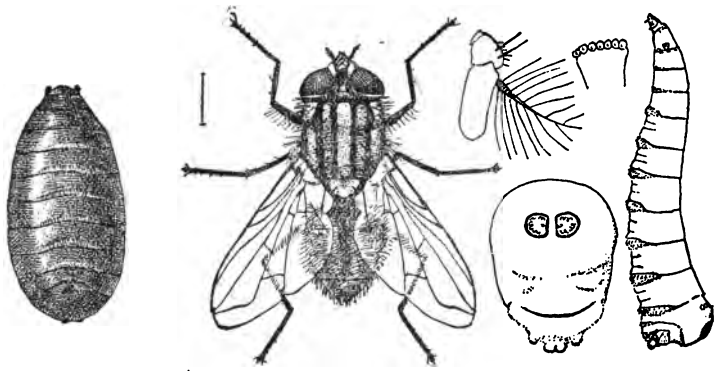


Fig. 3.—Common house fly *(Musca domestica)*: Puparium at left; adult next; larva and enlarged parts at right. All enarged. From circular 71 (by L. O. Howard), Bureau of Entomology, U. S. Department of Agriculture.

It is difficult to rate the importance of the pomace-fly as a carrier of disease. Howard has recently shown that these flies are attracted to dangerously foul substances, and that they may be responsible for the spread of certain diseases. Their method of dissemination of disease is much the same as that of the house-fly, with this exception that pomace-flies often breed in the food used by man, and their significance as carriers of typhoid bacilli can not be overestimated. In Pittsburg, September, 1908, I secured cultures from pomace-flies

found in a garbage-can in which excreta had been thrown, and within one hundred feet of a restaurant where hundreds of people dined daily.

HOUSE-ANTS

The most important species of ants found in houses is the little red ant (*Monomorium pharaonis L.*), the little black ant (*Mouomorium minntum Mayr*), and the pavement ant, of the Atlantic seaboard (*Tetramorium cæspitum L.*).

Perhaps the little red ant is the most thoroughly domesticated. It passes its entire existence in or about

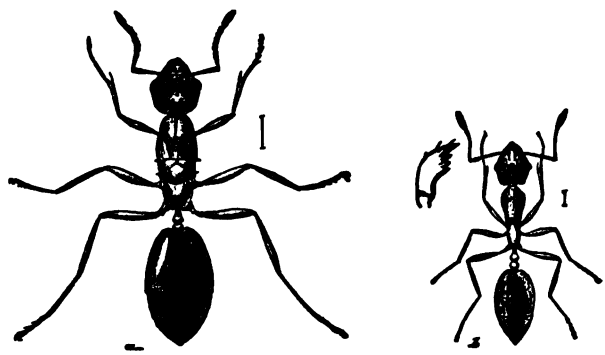


Fig. 4.—The red ant *(Monomorium pharaonis)*: A, female; b, worker. Enlarged. From circular 34 (by Riley), Bureau of Entomology, U. S. Department of Agriculture.

houses, having its nest in the walls or beneath the flooring, or in other places favorable to rapid ingress or egress near articles of food.

The habits and life histories of these several species of ants are much the same. The specimens usually seen in houses are all workers. The colony itself contains the larger wingless females, and at the proper season the winged males and females. During the greater part of the year the colony consists mostly of workers with one or more perfect wingless females.

In squalid homes, where the garbage-pail is used for the deposit of excreta, etc., it can be readily understood how these insects may become carriers of typhoid infection.

COCKROACHES

The cockroach is among the commonest and most offensive of insects which frequent human habitations (Marlatt). The American roach (*Periplaneta Ameri-*

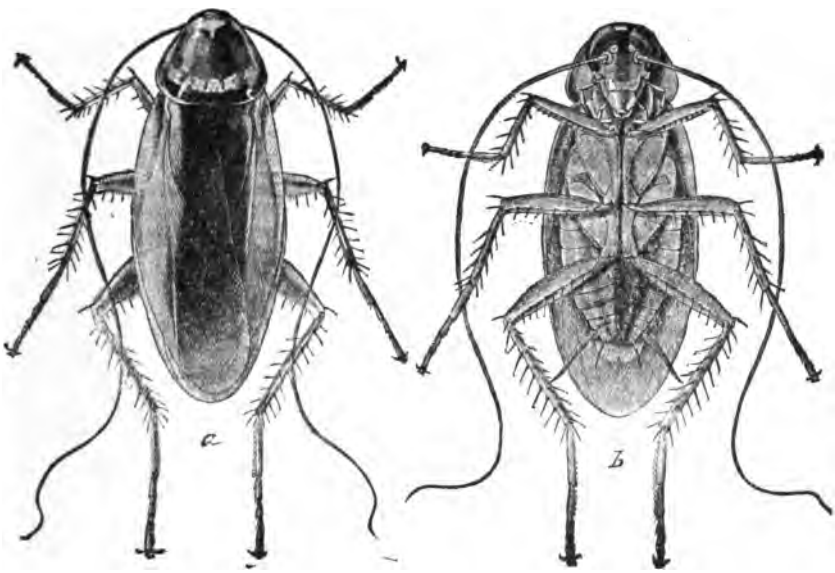


Fig. 5.—The American roach *(Periplaneta americana)*: A, view from above; b, from beneath. Both enlarged one-third. From circular 51 (C. L. Marlatt), Bureau of Entomology, U. S. Department of Agriculture.

cana) is the commonest of domestic species found in America. The house roach is particularly abundant in pantries, kitchens, store-rooms, and especially in the neighborhood of well-heated apartments. It conceals itself during the day behind baseboards, refrigerators, boxes, furniture, in damp or moist cracks about sinks, and wherever protection from light is afforded. Unless routed out, or suddenly uncovered from their hiding-

places, roaches are rarely seen. If discovered, they make off rapidly for other secure hiding-places. Domestic roaches congregate in large numbers at night and feed on almost any kind of food, dead animal matter, cereal products, leather, cloth, and such other materials as may suit their fancy for food or destruction. It is said that roaches are occasionally cannibalistic. They seem to be natural enemies of the bedbug, but as they do not usually frequent the places inhabitated by the bedbug they are not valuable as exterminators of that insect. Roaches travel from place to place, wherever their instinct may lead, to fertile fields for foraging.

Marlatt says:

> The roach, in its different stages from egg to adult, shows comparatively little variation in appearance or habits. The eggs, instead of being deported separately, as with most insects, are brought together within the abdomen of the mother into a hard, horny pod or capsule which often nearly fills the body of the parent. On hatching, it is said, the young are often kept together by the parent and brooded over and cared for; at least, a colony of young will usually be found associated with one or two older individuals. The common American roach (*Pariplaneta americana*) has been carried from egg to the adult state in our insectary. Young hatching July 11 from an egg-case received from Eagle Pass, Texas, reached the adult stage betweeen March 14 and June 12 of the following year, indicating a period of twelve months for development. The rate of growth undoubtedly depends very largely on food and temperature.

The omnivorous habits of the roach make it a prolific source and a ready carrier of disease. Engelmann has observed the relation of the cockroach to the conveyance of typhoid infection. It may carry disease from the source of infection on its body and limbs, or, by excreta, to drinking or other vessels used about the household, or even into the food.

HOUSE-FLEAS

The human flea (*Pulex irritans L.*) and the dog and cat flea (*Ctenocephalus canis, Curtis*) are among the common nuisances found in houses in this country.

Howard maintains that the flea most likely to be found in dwellings in this country is the cosmopolitan flea of the dog and cat. My observations, however, do not tend to confirm this, except in homes where these animals are kept. The human flea (*Pulex irritans*) is the prevailing flea of our country, and more especially in stock-raising districts. In small villages, where the homes are well-shaded and with a tendency to dampness, human fleas may be found in abundance. I have known an entire village to be infested with fleas after a drove of

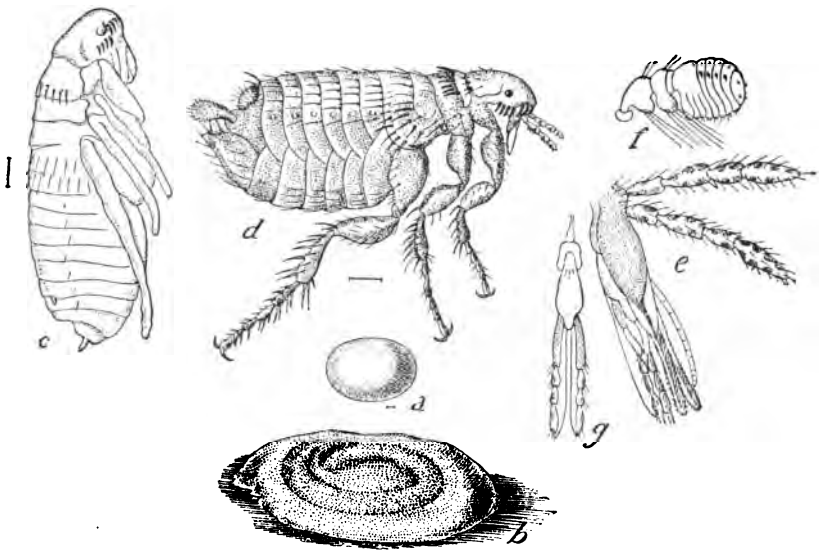


Fig. 6.—Cat and dog flea *(Ctenocephalus canis)*. A, egg; b, larva in cocoon; c, pupa; d, adult; e, mouth-parts of same from side; f, antenna; g, labium from below; b, c, d, much enlarged; a, e, f, g, more enlarged. From circular 108 (by L. O. Howard), Bureau of Entomology, U. S. Department of Agriculture.

hogs and cattle had been driven through it. Homes that are damp during the summer are most liable to be infested with fleas.

The eggs of the *Ctenocephalus canis* are deposited among the hairs of dogs, cats, and numerous other animals. They may be deposited where animal material is free. There they develop and live until full grown. In

warm, damp weather a generation may develop in a fortnight.

The flea, as a factor in the dissemination of plague and some other diseases, has been so fully established that it does not call for further comment here. The flea as a carrier of typhoid has not been so thoroughly brought out. From some 500 human fleas which were allowed to suck the blood of typhoid patients I have secured twenty cultures. Typhoid cultures were secured from 5 out of 650 of the dog and cat fleas. The extreme difficulty in securing the fleas, keeping them in captivity, and placing them in an artificial environment after possible injury, gives, I believe, a good reason for the small percentage of cultures. I am fully convinced, as were my confrères, that two of the cases which came under my service were inoculated by the house-flea.

BEDBUGS

The bedbug (*Cimex lectularius L.*) is the most loathsome insect infesting the habitations of man. It is commonly found in the homes of the squalid, yet it may be found in the palaces of kings. It is found in the cracks and crevices of old houses, in old mattresses, bedsteads, and more especially when these are approximate to human beings. It is nocturnal in its habits and inactive in cold weather. The food of the bedbug is normally human blood, yet it may subsist for a time on other substances. The eggs of the bedbug are laid in such places as are used by them for concealment. They are laid in clusters, each cluster containing six to fifty eggs. The period of growth, from the egg to the adult, varies greatly with temperature and food supply (Howard). Under ordinary conditions eight or ten weeks is necessary for the rearing of a generation of bedbugs.

The bedbug has been found by observers to be a factor in the transmission of various diseases, as tuberculosis and relapsing fever. I believe that my investigations, covering a period of three years, have a prior claim over

that of others in respect to the transmission of typhoid bacilli by the bedbug. I had observed among Poles, Italians, and Russians, in filthy quarters, where the beds had been used by typhoid patients, that succeeding occupants were stricken with typhoid. I had noted that after having been bitten with bedbugs, in from eight to fifteen days they were attacked with typhoid.

This disease-carrying factor was suggested to an Italian tenant of one of a number of typhoid-infected houses, with the advice that the beds be destroyed by fire and the house fumigated. The advice was refused. To

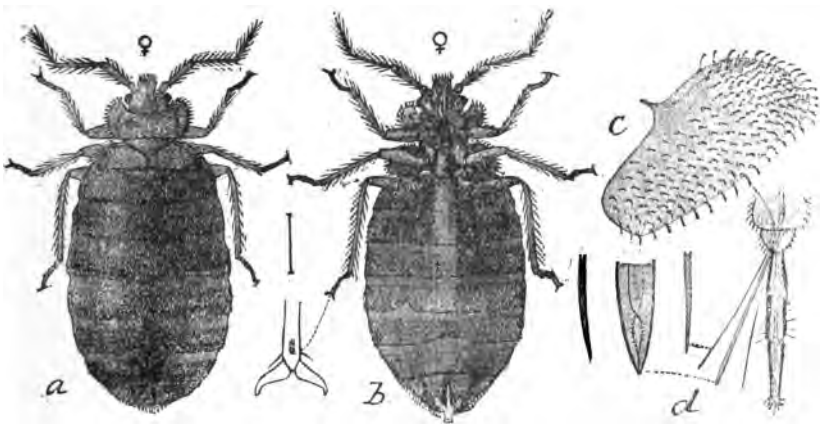


Fig. 7.—Bedbug *(Cimex lectularius)*: A, adult female, gorged with blood; b, same from below; c, rudimentary wind-pad; d, mouth-parts; a, b, much enlarged; c, d, highly magnified. From circular 47 (by C. L. Marlatt), Bureau of Entomology, U. S. Department of Agriculture.

test the case, the man offered himself for experiment. I collected some bedbugs, starved them for several days, then placed them on the abdomen of his 8-year-old daughter, who had typhoid, incarcerating them under a square piece of a fleece-lined undershirt, fastened at the edges with zinc oxid adhesive plaster. In six hours the bugs, satiated with blood, were imprisoned between soiled pieces of canvas and allowed to remain twenty-four hours. They were then transferred to the abdomen

of the father, imprisoned in the same manner as on the child, and allowed to remain twelve hours. It was noted that only about one-third of the bugs had bitten the subject. After removal, the bugs were crushed between glass slides and cultures made. These cultures showed the Eberth bacilli. Unfortunately, a few of the bugs escaped and fed on the blood of an 11-year-old boy, with whom the subject was sleeping. The father developed typhoid of the most virulent type in fourteen days and the boy in twelve days. The vitality of the *Bacillus typhosus* in the bedbug persists for several weeks, without any apparent lessening in virulency. In the case of the boy referred to above, the virulency was greatly increased.

MOSQUITOES

There are some 300 different mosquito species in the world, representing two dozen distinct genera. In North America, there are sixty species, representing ten genera. In the family Culicidæ are included two distinct types of mosquito, one with mouth-parts forming a long, slender, sucking proboscis, provided with sharp, needle-like stylets for piercing, the other with mouth-parts short and better adapted for lapping or supping liquids (Kellog). Two genera have a mouth of the latter type; all the others are piercers and blood-suckers. The females normally feed on plants, but when opportunity offers they feed on the blood of warm-blooded animals. Three genera of the piercing type are of special importance and interest to the medical profession, because of their relation to the development, incubation and dissemination of certain diseases of man and beast. These three genera are the *Culex, anopheles* and *Stegomyia* and, according to Kellogg, may be distinguished as follows:

Palpi (the mouth-feelers projecting by the side of the proboscis) long in both male and female, about as long as the proboscis: *Anopheles.* Palpi as long as proboscis

in male, but only one-third as long in female. Scales on the head narrow and curved: *Culex*. Scales on the head flat and broad: *Stegomyia*.

Stegomyia and *Culex* are the breeders and disseminators of yellow fever and filariasis, and to the anopheles is given the responsibility of the breeding of malaria. I have been able to make cultures, in two cases, from mosquitoes (anopheles) after they had been satiated with the blood of a typhoid patient. Although this is not enough clinical evidence to be conclusive, it marks a starting-point for further investigations. I believe, however, that I am not alone when I say that mosquitoes may be active disseminators of many other diseases.

It is generally conceded that the larvæ of mosquitoes are aquatic, yet they are air-breathers. They are rapid breeders and may pass through several generations in the course of a year. The duration of a single generation may be twelve days. As adults, they hibernate and may be found during winter months in houses, barns, cellars, cisterns, culverts, etc. Mosquitoes do not fly far, but may be carried by light continued winds considerable distance from their breeding-places. An important factor to be noted in the spread of yellow-fever epidemics, as well as other insect-carried diseases, is the direction of the prevailing wind.

REMEDIES

Hydrocyanic-acid gas is one of the most effective remedies against household insects. The cyanid and gas is a deadly poison, and great care should be used when a house is fumigated. Some old remedies are insect powder (as pyrethrum), benzine, kerosene, corrosive sublimate, oil of turpentine, fumigation with sulphur, bisulphid of carbon, and traps. Many insects have natural enemies; as the roach and red ant against the bedbug, the ichneumon fly and tree-frog against the roach. A careful screening of windows and doors during the summer months, the use of sticky fly-paper and the

elimination of breeding- and feeding-places will soon abate the fly nuisance. The means and methods of attack on the mosquito have been clearly delineated in recent literature by Gorgas, Guiteras, White and others. I will say in passing that by draining swamps, ponds and pools, the introduction of petroleum and other substances to kill the larvæ, the dissemination of dragon flies, and the screening of houses, cisterns, barrels, etc., leaves little for the pest to thrive on.

The stools and urine of typhoid patients must be disinfected with chlorinated lime, or by cremation the moment voided. Especial attention should be given to the antiseptic toilet of the mouth, nose, anus and meatus urinarius. Bedding, utensils and such articles as may come in contact with the patient should be scrupulously guarded and disinfected. These precautions are valuable and necessary under any and all circumstances, but we are somewhat nonplussed when we have to deal with the human carriers of typhoid bacilli.

All mosquitoes, bedbugs, and fleas, which have sucked the blood of typhoid patients, contain typhoid bacilli The virulence and vitality of typhoid bacilli are preserved in these insects. Typhoid bacilli may be found in these insects from eight to twenty-one days after they have sucked the blood of a typhoid patient. The feces of these infected insects contain virulent bacilli as long as they persist in the alimentary canal or in the blood or secretions. Insects which have fed on patients infected by bacilli of high virulence by means of bites convey infection of equal virulence. The local inflammatory reaction of patients to bites of these infected insects is slight, and, in fact, no more than from the uninfected insect. Infected insects may communicate the disease for two or three weeks after infection. The injury to the skin caused by the bites of mosquitoes, bedbugs, or fleas offers an avenue of infection for typhoid bacilli. The bed-linen fabrics, or other material, on which infected insects may be crushed, offers a ready source of

infection. All insects which feed on excreta, animal or vegetable material, and which frequent, breed and hatch, in or on, or come in contact with material infected with typhoid bacilli will become carriers thereof.

It may be argued that these insects do not bear a sufficiently important relation to the transmission of typhoid fever to be of value to preventive medicine. It is true that the evidence is not as convincing as it might be, but when we consider the unfavorable conditions under which investigations must necessarily be made it is certainly an important problem well worthy of further study. Occasionally the investigator is enabled to secure insects immediately after they have become infected, but generally he must work with captive insects, using artificial means, in a strange environment. Thus his efforts are often thwarted, and persistence, perseverance, and an immense amount of systematic work is necessary to secure positive results. The isolation of a pure culture of typhoid bacillus from the blood of suctorial insects is no small matter. The isolation of the bacillus from the alvine discharges is even more difficult. Yet these insects are marvelous factors in the dissemination of the typhoid bacillus.

I should like to voice the sentiments of Dr. White as to the importance and significance of the study of entomology by physicians. It is a field practically untilled; yet some of the greatest advances of preventive medicine in modern times are due to the work of those who have labored therein. The pioneer work of Laveran, Manson, Ross, Sternberg and others initiated the campaign against the malaria-bearing mosquitoes. The subsequent researches of Manson and Bancroft have proved that filariæ are transmitted by mosquitoes. The suggestion, based on observations by Dr. Charles J. Finlay of Havana, that mosquitoes might be agents in spreading yellow fever was slightly regarded and even contemptuously received by investigators. It remained for the Army Yellow Fever Commission, in 1900, to report that yel-

low fever followed the bite of mosquito species, *Stegomyia fasciata.* Eminent investigators (Reed and Lazear of America and Dutton of Liverpool) lost their lives from attacks of the disease they were studying, caused by insects. The work that these pioneers had so nobly advanced has been efficiently maintained by Gorgas, White, and others associated with them in their work.

In this brief account of the rôle that certain insects play in the propagation and dissemination of typhoid fever, only a small part has been told. I believe that within two years observers will be able to find that insects are the disseminating medium of various other diseases. The medical profession and laity are fortunate to have the government bureau of entomology, under the efficient direction of Dr. L. O. Howard, it having made possible many advances in preventive medicine.

The study of entomology and its relation to disease is comparatively recent, and it offers one of the most prolific and promising fields in preventive medicine.

624 Pittsburg Life Building.

BIBLIOGRAPHY

Aldridge, A. R.: House-Flies as Carriers of Enteric Fever Infection, Jour. Roy. Army. Med. Corps, London, 1901, ix, 558; The Spread of the Infection of Enteric Fever by Flies. Ibid., 1904, iii, 649-651.

Albert, H.: Insects: The Rôle They Play in the Transmission of Disease, New York Med. Jour., 1905, lxxxi, 220.

Anderson, J. F.: The Differentiation of Outbreaks of Typhoid Fever Due to Infection by Water, Milk, Flies and Contacts, Med. Record, Nov. 28, 1908, lxxiv, 909.

Austin, E. E.: The House-Fly and Certain Allied Species as Disseminators of Enteric Fever Among Troops in the Field, Jour. Roy. Army Med. Corps, London, 1904, ii, 651.

Baker, C. F.: Fleas and Disease, Science, 1905, New Series, xxii, 340.

Barsacq, J.: De l'action comparative de quelque poisons des insectes, Rev. Scient. Par., 1907, vii, 721.

Bergey, D. H.: The Relation of Insects to the Dissemination of Disease, New York Med. Jour., 1907, lxxxv, 1120.

Biting and Noxious Insects Other than Mosquitoes, Rep. Wellcome Research Lab., Khartoum, 1904.

Campbell, C.: House-Flies and Disease, Brit. Med. Jour., 1901, ii, 980.

Chapman and Johnston: House-Flies and Disease, Brit. Med. Jour., 1901, ii, 126.

Coplin, W. M. S.: The Propagation of Disease by Means of Insects with Special Consideration of the Common Domestic Types, Pennsylvania Med. Jour., iii, 241.

Cleaver, Emma O.: The Rôle of Insects in the Transmission of Disease; a Résumé, Pennsylvania Med. Jour., 1900, iv, 457.

Craig, C. F.: The Transmission of Disease by Certain Insects; Ticks, Bedbugs, Ants, etc., New York Med. Jour., 1898, lxviii, 593.

Ellis, A. G.: Insects as a means of Spreading Infectious Diseases, Med. Age, 1899, xvii, 641-646.

Engelmann, Rosa: Cockroaches as Conveyers of Typhoid Infection, Illinois Med. Jour., 1903, New Series, v, 326.

Feitz, J. E.: Prophylaxis of Typhoid Fever with the Influence of the Soil, Fabrics, and Flies in the Dissemination of Typhoid Fever, Jour. Kansas Med. Soc., 1906, vi, 307.

Gayen, J. P.: A Note Concerning the Transmission of Pathogenic Fungus by Flies and Mosquitoes, Rep. Am. Pub. Health Assn., 1902, 1903, xxviii, 116.

Geddings, H. D.: Précis on the Fly and Mosquito as Carriers of Disease, Washington Government Printing Office, 1903; the Fly and Mosquito as Carriers of Disease, Pub. Health Rep., U. S. P. H. and M.-H. Service, Wash., 1903, 18 (Suppl. No. 35).

Hamilton, Alice: The Fly as a Carrier of Typhoid, THE JOURNAL A. M. A., 1903, xl, 576; The Rôle of the House-Fly and Other Insects in the Spread of Infectious Diseases, Illinois Med. Jour., 1906, ix, 583.

The House-Fly and Its Dangers, Indian Lancet, Calcutta, 1899, xiv, 392.

Howard: The Insect Book, 1905.

Howlett, R. T.: Insects as Carriers of Disease, Med. Press and Circular, London, 1903, New Series, lxxvi, 439.

Homan, G.: The Agency of Parasitic Vermin and Other Insect Pests in the Spread of Disease, Am. Med., 1901, ii, 536.

Kellogg: Insects, 1908.

Klein, E.: Flies as Carriers of the Bacillus Typhosus, Brit. Med. Jour., Oct. 17, 1908, p. 1150.

Lambotte: Insectes et maladies infectieuses, Ann. Soc. méd.-chir. de Liège, 1905, xliv, 371.

Leidy, J.: The Common House-Fly as a Factor in the Transmission of Disease Germs, Philadelphia Med. Jour., 1901, vii, 49.

Manning, J.: A Preliminary Report on the Transmission of Pathogenic Germs by the Common House-Fly, THE JOURNAL A. M. A., 1902, xxxviii, 1291.

Martin, A. W.: Flies in Relation to Typhoid Fever and Summer Diarrhea, Pub. Health, London, 1902-3, xv, 652.

Mason, C. F.: The Spread of Disease of Insects, with Suggestions Regarding Prophylaxis, Internat. Clin., 1904, Series 14, ii, 1-24.

Manewaring, W. H.: Flies as Carriers of Bacteria, Jour. Applied Micr., Rochester, 1903, vi, 2402.

Mignen, Pierre: Les insectes buveurs de sang et colporteurs de virus, Paris, 1906.

MacDougall, R. S.: Insects and Arachnids in Relation to the Spread of Disease, Pharm. Jour., London, 1906, Series 4, xxii, 60.

McFarland, J.: Relation of Insects to the Spread of Disease, Medicine, 1902, viii, 1.

Notes on the Part Played by Insects as Carriers of Infection, Brit. Med. Jour., 1900, i, 328.

Nuttall, G. H. F.: The Rôle of Insects, Arachnids, and Myriapods as Carriers in the Spread of Bacterial and Parasitic Diseases of Man and Animals; a Critical and Historical Study, Johns Hopkins Hosp. Rep., 1899, viii, 1.

Oldham, W. H.: Are Flies the Cause of Enteric Fever? Jour. Roy. Army Med. Corps, London, 1908, x, 528-530.

Schilling, C.: Die Uebertragung von Krankheiten durch Insekten und ihre Bekampfung, Gesundh. Ingenieur, 1907, xxx, 300-303.

Stallham, J. C. B.: The Complex Nature of Typhoid Etiology and the Rôle Played by Animals and Man in the Spread of the Typhoid Group of Diseases, Jour. Roy. Army Med. Corps, 1908, xxi, 351.

Underwood, W. S.: The House-Fly as a Carrier of Disease, Boston, 1903.

Veeder, M. A.: The Relative Importance of Flies and Water-Supply in Spreading Disease, Med. Rec., Jan. 7, 1899, lv, 10; Flies as Spreaders of Sickness in Camps, Med. Rec., Sept. 17, 1898, liv, 429.

Wilkerson, W. M.: Flies and Mosquitoes as Carriers or Propagators of Disease, Mobile Med. Surg. Jour., 1904, iv, 125.

TYPHOID IMMUNITY AND ANTITYPHOID INOCULATION

WILLARD J. STONE, B.Sc., M.D.
Attending Physician St. Vincent's Hospital
TOLEDO, OHIO

The difficulties attending the diagnosis of mild types of typhoid fever have made the study of the duration of immunity conferred by an attack a perplexing one. The differentiation of typhoid-like, paratyphoid, colon and paracolon infections is by no means easy, even for those so fortunate as to have at their disposal ample facilities for conducting blood culture and agglutination tests against strains of all the bacteria mentioned.

Typhoid simulating mild types of meningitis, early tuberculosis and many pneumonias with delayed resolution, likewise malarial fever (so-called) is frequently overlooked. In our hospital wards one rarely hears, in taking the history of a typhoid case, reference to an earlier attack. Most writers agree that, as in many other acute systemic infections, one attack is sufficient to produce a probable, although not absolute, immunity against later attack. Dreschfeld's figures, based on 2,000 cases in the Hamburg General Hospital, show that only 0.7 per cent. were affected twice. It is extremely probable, however, that the actual incidence of attack in individuals once infected is much greater than these figures indicate because of lack of facility in the way of accurate laboratory and clinical observation in many localities where the disease is prevalent.

The various antibacterial substance elaborated in the blood and the tissue fluids of an infected individual

serve, however, in a large percentage of cases to protect against subsequent attack. These antitropic substances, the agglutinins, lysins, bactericidins and latterly the bodies concerned with phagocytosis (the opsonins and stimulins), are distinctly antibacterial rather than antitoxic in their function. The process of immunization in typhoid is, according to present knowledge, a matter of specific reaction on the part of the body cells to the protein molecule making up the cell structure of the bacterium. This reaction is specific for the protein molecule exciting the reaction on the part of the body cells and take place, according to Vaughan and Wheeler,[1] through the liberation of a specific ferment which is activated or liberated through excitation by the proteid in question, whether bacterial, animal or vegetable. Such specific reaction in the process of immunity protects only against the specific proteid derivative which calls it forth; that is to say, the proteid derivatives obtained from colon bacilli protect, when inoculated, only against colon bacilli. The reaction is specific in the sense that the antibacterial substances elaborated under the influence of an infection are protective only against that infection.

THE BLOOD CHANGES DURING AND FOLLOWING AN ATTACK OF TYPHOID FEVER

Agglutinins.—During the second week of typhoid fever the agglutinins, in accord with general experience, are increased so that, on an average, the serum will agglutinate typhoid bacilli in dilutions from 1 in 100 to 1 in 200, exceptionally 1 in 400 or higher. After the decline of the fever there is rapid decrease in agglutinative value, the average being 1 in 60 or 1 in 80. For a few months to one year or longer this value remains low at about 1 in 40 to 1 in 60. (In my own case eighteen months after an attack of typhoid the serum would

1. Vaughan, V. C., and Wheeler, May S.: Experimental Immunity to Colon and Typhoid Bacilli, New York Med. Jour., June 22, 1907.

agglutinate in dilutions of 1 in 60.) Exceptionally a very high agglutinative value may be obtained as mentioned by Leishman and Harrison,[2] who refer to one patient whose serum, six months after the commencement of the illness, would agglutinate in dilutions of 1 in 1000.

Bactericidins.[3]—The bactericidal powers are increased, on an average, two or three times above the normal (which has more or less bactericidal power in dilutions from 1 in 10 to 1 in 20) during the first few weeks after the commencement of an attack. This power gradually falls at the decline of the fever so that the normal is reached at above the fourth month. Fatal cases may show a relatively high bactericidal power.

Opsonins.[4]—In contrast to the low bactericidal power of serum obtained during the decline of the fever and afterward, the opsonic index is relatively high. During the first few weeks of the fever the index is increased to 1.5 to 3.5. There is usually a slight decline during convalescence, although occasionally high indices may be obtained at this time. As a rule a high index, from 2 to 3, is found to persist for months after an attack. The only fatal case (bowel perforation at the end of the second week) I have been able to follow had a low index of 0.6 from the beginning. The general impression is that cases manifesting a persistently low index have a less favorable prognosis. This may be true for the patients who die in typhoid from exhaustion, a relatively small number, when compared with those dying from hemorrhage or perforation. It is conceivable, on the

2. Leishman, W. B., Harrison, W. S., et al: Third Report on Experiments in Connection with Antityphoid Vaccine, Jour. Roy. Army Med. Corps, October, 1908.

3. To determine the bactericidal power of a serum progressive dilutions are mixed with a measured quantity of twenty-four-hour broth culture of bacilli and allowed to remain in the incubator at 37 C. for fifteen minutes. Agar plates are then inoculated with the mixture and the number of colonies which develop after twenty-four hours are estimated.

4. It makes some difference in the results obtained whether one uses the method of Wright or Klein in estimating the index; also whether a virulent or non-virulent strain is used for the bacterial emulsion.

other hand, that a low phagocytic power to destroy bacilli locally is responsible for extensive necrosis of an intestinal ulcer leading to such erosion as eventually favors hemorrhage or perforation.

Stimulins.—Heating a serum to 60 C. renders the opsonin it contains inert, at least for some strains of typhoid bacilli. On the other hand, some strains are more readily phagocytable when the serum is heated to 60 C. The substance remaining in the blood serum heated to 60 which is still capable of inducing phagocytosis has been called "stimulin." It is more stable than opsonin. In some cases cited by the Royal Army Commission, heated serums showed double the power to activate phagocytes over that obtained with unheated serums. The only statistics available in this connection are those of Leishman and Harrison,[2] who estimated the stimulin value of the serums of thirty-five typhoid patients by adding a small amount of their heated serums to heated normal serum which was then tested as to its power to stimulate the phagocytic activity of normal leucocytes. During convalescence and afterward the stimulin curve rises considerable above normal to 2 or 2.5, at about which points it is maintained for months after the attack.

PREPARATION OF ANTITYPHOID VACCINE

The early history of antityphoid inoculation concerned itself with the same problems which led up to the Pasteur methods of inoculation against rabies and anthrax or to the anticholera inoculations of Haffkine; i. e., by the use of attenuated living virus. Such methods of procedure in typhoid prophylaxis have seemed to be quite beyond the necessity of its scope. The pioneer work of Prof. R. Pfeiffer,[5] in 1896, who was able to obtain a specific agglutinin reaction in man by the injection of heated typhoid culture in two cases, led,

5. Pfeiffer, R., and Kolle: Deutsch. med. Wchnschr., Nov. 12, 1896.

through a personal communication to A. E. Wright, to the experimental work and the publishing of the results of two inoculations by him.[6]

To Wright belongs the credit of placing the method on a rational basis through many thousand preventive inoculations made in the British army in India and during the Boer War. The investigations carried on in the laboratories of the Royal Army Medical College under Leishman, as well as the stamp of approval placed on the results obtained by the Royal Army Commission and the Royal College of Physicians, to which was referred the question of the efficacy of antityphoid inoculation, has done much to dispel the skepticism with which it was first regarded.

Wright's method, with slight modification, has been followed since that time. In general as in the preparation of other bacterial vaccines the following principles are followed: 1. The vaccine must be capable of stimulating the production of protective typhocidins, lysins, agglutinins and opsonins (typhoid and cholera differ from many other acute infections in that bactericidins and bacteriolysins are largely limited to them). 2. The vaccine must not be so altered in its preparation by heat or chemical agents as to impair its immunizing properties. 3. The dosage employed must be sufficient to maintain a phase of increased resistance to infection for a considerable period.

In the earlier work the vaccine was prepared as follows: Broth cultures of non-virulent typhoid bacilli, after from 10 to 21 days' growth at 37 C., were standardized and exposed to a temperature of 60 C. for fifteen minutes, after which 0.45 to 0.50 per cent. phenol was added for purpose of preservation. Broth cultures cultivated for from ten to twenty-one days undergo considerable autolysis so that standardization is difficult, so that more recently twenty-four-hour broth cultures have been used (agar cultures twenty hours old may be

6. Wright, A. E.: Lancet, London, Sept. 18, 1896.

used in the preparation of vaccine on a smaller scale). Overheating greatly impairs the immunizing properties of the vaccine. The thermal death point of most strains of typhoid bacilli is 53 C. (occasionally one may meet with an exceptionally resistant strain) at which point, at present, the bacterial suspension is maintained for one hour.

The addition of phenol or liquor cresolis compositus to the vaccine when hot destroys its immunizing efficacy. Liquor cresolis compositus (0.25 per cent.), which is largely used, is sufficient to preserve the vaccine against contaminating anaërobes or spore-bearing bacteria. Phenol is in some respects superior to liquor cresolis compositus, since the cloudy, at times clumpy, masses found in some cresolized salt solutions are avoided. I have more recently avoided heat in the preparation of the vaccine. Harrison[7] has shown that 0.2 per cent. compound solution of cresol is sufficient to inhibit the growth of typhoid bacilli in broth, while Leishman and his co-workers[8] have shown that 0.25 per cent. liquor cresolis compositus added to unheated typhoid vaccine is sufficient of itself to render it sterile in twenty-four hours. Moreover, vaccine prepared by the simple addition of liquor cresolis compositus without heat is capable of inducing in rabbits a rise in agglutinins, bactericidal substances and in substances concerned with phagocytosis. I have more recently added 0.4 to 0.5 per cent. phenol in normal salt to the bacterial suspension *without* heat in the preparation of the vaccine. The vaccine is sterile in forty-eight to seventy-two hours. Such vaccines seem to produce a rise in the antibodies concerned with immunization in smaller dosage than vaccines killed by heat. On the other hand, it should be noted that heating a typhoid vaccine to 53 C. for one hour does not impair it.

7. Harrison, W. S.: Report on Experiments in Connection with Antityphoid Vaccine, Jour. Roy. Army Med. Corps, May, 1907.

8. Leishman, W. B., et al: Report on Further Experiments in Connection with Antityphoid Inoculation, a continuation of work published in Jour. Roy. Army Med. Corps for May, 1907.

Along this line it may be of interest to mention certain results obtained with other chemical agents used to devitalize bacterial vaccines without heat. Acetozone in saturated solution, 1 to 1,000, was used as a diluent. A suspension of three strains of typhoid bacilli containing approximately 5,000,000,000 per c.c. was diluted with twenty volumes of acetozone, 1 in 1,000. The suspension was sterile in forty-eight hours. Doses of this vaccine when inoculated in one individual produced after fourteen days an agglutinative reaction in one-half hour after administration, with a 1 in 500 dilution of the serum.

Acetozone, 1 in 1,000, in doses of 1 to 2 c.c., is non-irritating when injected subcutaneously. A 1-in-2,000 acetozone solution failed to sterilize a vaccine made from an avirulent strain in five days. A saturated chloretone (0.5 to 0.7 per cent. with heat) in normal salt (after a suggestion by Dr. Willard H. Hutchings) would sterilize unheated bacterial suspensions of typhoid containing 1,000,000,000 and 2,000,000,000 per c.c., respectively, in twenty-four hours, but the vaccine containing 2,000,000,000 per c.c. germinated and a diffuse growth on agar was obtainable after seventy-two hours, while the 1,000,000,000 vaccine was still sterile after ten days.

Macfadyen[9] suggested in 1903 a method of preparing typhoid vaccine by trituration and grinding, such as is used in the preparation of Koch's new tuberculin. Such a method, without the security of sterilization, involves the risk of transmitting infection and does not produce a more potent vaccine. Among the other methods which have been tried may be mentioned the use of "washed bacteria" as a vaccine; bacterial suspensions killed by chloroform vapor, and vaccine killed by the addition of 20 per cent. neutral glycerin. All of those methods pro-

9. Proc. Roy. Soc., 1903, quoted by A. E. Wright in A Short Treatise on Antityphoid Inoculation, London, 1904.

duce a rise in the substances concerned with acquired immunity, but no more effectively than the standard vaccine. Harrison has used typhoid bacilli in glycerin emulsion by mouth, also sterile typhoid bacilli suspended in fat and enclosed in gelatine capsules, by mouth. Although it appeared possible to increase slightly the antibacterial elements in the blood by such methods of administration the results, on the whole, were not as satisfactory as those obtained by subcutaneous inoculation.

THE RELATIVE EFFICIENCY OF VACCINES PREPARED FROM VIRULENT AND NON-VIRULENT STRAINS

The earlier work done with various strains of typhoid bacilli, as in the preparation of other vaccines, seemed to convey the impression that virulent strains, when injected, produced a more decided rise in protective antibodies than vaccines prepared from non-virulent, long-cultivated strains. This impression has not been borne out by facts. A typhoid vaccine prepared from a single non-virulent strain is quite as capable of inducing a sufficient immunizing response as vaccine prepared from two or more virulent strains. This protection exists against other non-virulent strains and also against single or multiple virulent strains.

DURATION OF POTENCY OF TYPHOID VACCINES

Typhoid vaccine six months or more old is apt to lose a considerable amount of its immunizing potency. Vaccine three months old has been found by Leishman and Harrison to be as potent as when freshly made.

To be on the safe side, vaccine not over three or four months old should be used. Extreme degrees of heat or cold seem to affect the immunizing qualities of a vaccine if kept for a considerable period under such conditions. Room temperatures seem best suited for preservation.

METHOD OF ADMINISTRATION AND DOSAGE: THE LOCAL AND GENERAL REACTION

Although a considerable immunity results from one inoculation of 500,000,000 to 1,000,000,000 bacilli, this immunity may be much augmented by a subsequent injection of 1,000,000,000 ten to fourteen days. The Royal Army Commission, appointed in October, 1904, found that an interval of about ten days should separate the doses. The first dose consists of 500,000,000 to 1,000,000,000 and the second from 1,000,000,000 to 1,500,000,000. The injections are conveniently given subcutaneously on the outer side of the upper third of the arm near the point of insertion of the deltoid, or subcutaneously in the abdominal wall. The needle should not puncture the muscle, as pain is produced and a considerable local reaction follows. The site of injection usually becomes reddened and slightly tender to touch, but these local manifestations disappear in about twenty-four hours. The first dose of vaccine does not, in my experience, produce any marked degree of reaction, local or general. Occasionally in a hypersusceptible subject the general reaction is severe. This is manifested by a feeling of malaise and headache with more or less general muscular aching and a temperature which may reach 100 or 101 F. for a few hours. This general reaction is more apt to occur after the second injection of 1,000,000,000 to 1,500,000,000, but it disappears within twenty-four hours. Patients are seldom required to give up their work. The best time for administration of the vaccine is in the late afternoon so that rest may be secured early in the evening.

THE BLOOD CHANGES AFTER PREVENTIVE INOCULATIONS AND THE DURATION OF IMMUNITY

Agglutinins.—The agglutination curve begins to rise about nine days after an inoculation and reaches on an average 1 in 500 to 1 in 1,000 by the tenth or eleventh day. The average has been about 1 in 500 in my cases.

Occasionally a very high agglutinative point may be reached as in a case cited by Shoemaker,[10] in which eleven days after the first inoculation agglutination was obtained in a dilution of 1 in 12,800.

The immediate effect of the second inoculation may be temporarily to lower the agglutinative value reached as a result of the first inoculation, for twenty-four to thirty-six hours, but the value is then increased, reaching in some cases 1 in 1,200, 1 in 1,500, to 1 in 8,000. Such a high point may be maintained for a number of months, but a decline manifests itself within a year, at the end of which time the serum will usually agglutinate bacilli in dilutions of 1 in 100 or 1 in 200. Harrison has reported agglutinin reactions in dilutions of 1 in 30 four years after inoculation and complete reactions in dilution of 1 in 20 after six years.

Bactericidins.—The bactericidal substances are increased fourfold or fivefold by the inoculations. There seems to be less decrease in these substances after considerable time than in the agglutinin value of the serum. For example, Harrison has found the bactericidal value four times the normal one year after inoculation; three or four times the normal after four years, and two and one-half times the normal after six years.

Bacteriolysins.—The bacteriolytic substances are likewise increased. Serums from inoculated subjects diluted 1 in 5 to 1 in 10 and mixed with living typhoid bacilli cause either complete disappearance of the organisms or their reduction to amorphous masses.

Opsonins and Stimulins.—The opsonic index is markedly increased, reaching often 2 or 2.5 after the first and 3 to 5.5 after the second inoculation. Stimulins are also increased; serum after the inoculations when heated to 60 C. gives from one and a half to two times the power to activate phagocytes over that shown by un-

10. Shoemaker, H.: Observations on Prophylactic Inoculation Against Typhoid Fever, New York Med. Jour., Feb. 6, 1909.

heated serum. In general the results obtained by Leishman and Harrison agree with those obtained by Klein,[11] who found, by dilution experiments, in immunizing rabbits by subcutaneous injections of living typhoid bacilli, that opsonins were considerably augmented. He also found that typho-agglutinins and lysins were increased and comparatively, that the opsonins and lysins increased more rapidly than agglutinins. The discrepant results obtained, as regards the opsonins, have been shown by Clark and Simonds[12] to be due to the use of different strains of organisms. Markedly divergent results may be obtained using different strains with the same serum. In fact, some strains, when freshly isolated, may give considerable spontaneous phagocytosis, while repeated transplantation of strains which do not induce spontaneous phagocytosis may render them very susceptible to phagocytes in the absence of serum. One strain virulent to rabbits may give a lower opsonic index with rabbit serum than a non-virulent strain, while again with the same serum another virulent strain may give a higher index than the non-virulent strain.

The duration of immunity produced by preventive inoculations has been variously estimated at from two to six years. In many cases the immunity probably lasts for life, although of this conjecture no definite proof exists. Whether the immunity following the inoculations in man is sufficient to ward off infection with virulent typhoid bacilli is not known. The striking preponderance of the substances which have to do with phagocytosis (opsonins and stimulins) stand out more clearly as evidence of increased protection following preventive inoculations than the other bacteriotropic substances concerned with this form of acquired immunity.

11. Klein, H.: Johns Hopkins Hosp. Bull., 1907, xviii, 245.
12. Clark, C. P., and Simonds, J. P.: Jour Infect. Dis., 1908, i, 1.

THE PROTECTIVE POWER OF ANTITYPHOID VACCINE AGAINST PARATYPHOID INFECTION

Since the substances concerned with acquired immunity to typhoid have been shown to be largely those which pertain to phagocytosis, the opsonins and stimulins, it becomes a matter of interest to know whether the injection of antityphoid vaccine increases the phagocytic stimulating activity of the blood serum against paratyphoid infection. Clark and Simonds[12] find that "opsonins arising in typhoid fever are generally, if not constantly, equally capable of stimulating phagocytosis of paratyphoid bacilli," and, moreover, that the injection of either typhoid or paratyphoid vaccine caused a rise in the opsonic index for both organisms in rabbits. The index gradually increased after each injection. On the other hand, Leishman and his co-workers did not find that inoculations of antityphoid vaccine in man produced any increase in the phagocytic value or, for that matter, any increase in agglutinins or bactericidins, when tested against two strains of paratyphoid bacilli. In the light of these differences it may be concluded that the matter of protection against paratyphoid fever afforded by injections of antityphoid vaccine has not been settled.

CONDENSED STATISTICS RELATIVE TO ANTITYPHOID INOCULATION IN THE BRITISH ARMY AND THE ADOPTION OF THE PROCEDURE IN THE U. S. ARMY

Leishman[13] has recently given the results of inoculation in the second battalion of the Royal Fusiliers in India from December, 1904.

TABLE 1.—RESULTS OF INOCULATION IN ONE BATTALION

Strength of Regiment.	No. Inoc.	Admitted to Hospital to Date.			
		Non-inoculated.		Inoculated.	
		Cases.	Deaths.	Cases.	Deaths.
12/31/1905, 883	103	2	0	0	0
12/31/1906, 1013	181	35	5	9	0

13. Leishman, W. B.: Antityphoid Inoculation in the British Army, Mil. Surg., 1908, xxii, 6.

The statistics of the Seventeenth Lancers in India from October, 1905, are also very favorable. In a regiment varying from 508 to 680 men, 425 men were inoculated with antityphoid vaccine from October, 1905,, to May 1, 1907. Among the inoculated men during this period, two developed typhoid with no deaths, while among the non-inoculated men there occurred 69 cases of typhoid with eleven deaths. Among the inoculated men, each of the two in whom typhoid occurred had refused to take the second dose of vaccine, which in the case of this regiment was prepared at 53 C. No case of typhoid has occurred in this regiment among the men who received two inoculations of this vaccine. In seven large India regiments the results have been as shown in Table 2.

TABLE 2.—RESULTS OF INOCULATION IN SEVEN REGIMENTS, JANUARY 1 TO JUNE 30, 1907

Strength.	Cases.	Deaths.	Incidence Per 1000	Mortality Per 1000
Non-Inoculated..8113	173	42	21.32 (+1.08)	5.18 (+0.54)
Inoculated.....2207	15	3	9.80 (+1.18)	1.36 (+0.53)

The latest statistics in the British army[14] up to June 1, 1908, relative to prophylactic inoculation are as follows: Among 12,083 men comprising sixteen regimental units, 5,473 were inoculated. These regiments were stationed in India, Egypt, Malta, Crete, South Africa, etc. The case incidence per thousand, taken as a whole, among the inoculated men, was 3.8, while among the non-inoculated men the case incidence per thousand was 28.3. Among those sixteen units in which typhoid occurred (typhoid did not occur in some of the regiments) the case incidence per thousand among the inoculated men was 6.6, while among the non-inoculated men the case incidence per thousand was 39.5.

In the U. S. army, the work begun last December, as a result of the conclusions reached by the medical board appointed for the purpose, is well under way.

14. Leishman, W. B.: Statistical Table of Recent Results of Antityphoid Inoculation, Jour. Roy. Army Med. Corps, 1908.

This board consisted of Surgeon-General O'Reilly, V. C. Vaughan, W. T. Councilman, J. H. Musser, A. Lambert, Simon Flexner, W. S. Thayer and Major F. F. Russell, of the Medical Corps, U. S. Army. The conclusions reached by them are as follows:

1. The board is convinced that the practice of antityphoid vaccination is both useful and harmless, and that it offers a practicable means of diminishing the amount of typhoid fever in the army, both in times of peace and war.

2. It finds that the experience to date with antityphoid vaccination justifies it in recommending the introduction of the practice in the regular and volunteer armies in time of war.

3. It recommends the immediate introduction of the practice of vaccination against typhoid in the Hospital Corps, the Army Nurse Corps, and in any expedition of troops from the regular army which is ordered to take the field for active operations; and further, that an opportunity be given to volunteers from the army as a whole to be protected by vaccination against typhoid.

The vaccination work is under the charge of Major Russell, of the Medical Corps, and is entirely voluntary.

THE INOCULATION OF ANTITYPHOID VACCINE IN TYPHOID-CARRIERS. IN ENDEMIC AND EPIDEMIC AREAS. GENERAL CONCLUSIONS

Investigations have established that about 4 per cent. of convalescent typhoid cases become chronic "typhoid-carriers," disseminating the infection more or less constantly with the feces and urine for periods of years.

Where new cases of the disease can, with fair degree of presumption, be traced by appropriate bacteriologic tests to such individuals, especially cooks, dairymen or dairymaids, workers in confectionery, waiters and waitresses or those who have to do with the handling of food in any way, the inoculation of antityphoid vaccine offers a more certain means of raising the bacterial resistance in such individuals than any other known method of treatment.

The method of antityphoid vaccination involves no risk and is especially applicable for those constantly exposed to infection, such as nurses, hospital attendants and physicians.

Antityphoid inoculations should be avoided if possible in individuals during the incubation stage of typhoid, for, although it is probable that the stage of diminished resistance (negative phase) for a few days following the inoculation is more theoretical than real, it is more wise, in the present state of knowledge, to avoid the possibility of cumulation.

In endemic areas, where a considerable proportion of the population annually suffers the infection, or in epidemic areas, where there is reason to suppose the possibility of widespread infection, inoculations of antityphoid vaccine are indicated in individuals not in the prodromal or incubation stage of the disease.

The Colton Building.

EPIDEMIOLOGIC STUDIES OF TYPHOID FEVER

L. L. LUMSDEN, M.D.
Passed Assistant Surgeon, U. S. Public Health and Marine-Hospital Service
WASHINGTON, D. C.

PREVALENCE OF TYPHOID FEVER IN THE UNITED STATES

Judging by obtainable figures, there are in the United States comparatively few communities of over 1,000 persons which during any period of twelve consecutive months within the past ten years have been entirely free from typhoid fever. The extensive prevalence of this thoroughly preventable disease in our country as a whole is beginning to be justly considered a national disgrace.

Communities, like individuals, seem to be as a rule unable to profit by the experiences of others, and the history of typhoid fever is replete with instances of communities having failed to carry out clearly indicated preventive measures until the occurrence among them of severe epidemics has caused an awakening.

NATURE AND SOURCE OF THE INFECTIOUS AGENT

At present the generally accepted view is that typhoid fever is an infectious disease caused by a specific parasitic organism, the typhoid bacillus. The undetermined elements in the causation of the disease are those concerned in the establishment of individual susceptibility to the infection and, in some instances, those concerned in the transmission of the infection. All known facts on the subject support the view that man is the permanent host of the parasitic organisms which

cause typhoid fever, and that if their multiplication in and their dissemination by the human host could be prevented these organisms would soon perish from the earth. Therefore, what appears a sound belief, based on epidemiologic findings, is that "each and every case of typhoid fever comes somehow from some previous case." (Sedgwick).

PREVENTION OF INFECTION

The specific parasite which causes typhoid fever and its permanent host being known, an apparently simple formula to prevent the disease is to destroy the infection as it leaves the bodies of infectious persons. Could such a plan of action be made sufficiently wide in scope it would promise success; but the people of a given community may use water, milk and various foodstuffs obtained from a distance and liable to contamination with the excreta of infectious persons over whom their own health officials have no jurisdiction. Therefore, for the local health officer the two principal plans of action to prevent typhoid fever in his community should be the following:

1. The discovery of and the prevention of the spread of infection from persons in his community who harbor infection (typhoid fever patients and bacillus-carriers).

2. The prevention of the introduction of infection into his community from without through various channels, such as the water-supply, milk-supply, and the general food-supply.

DETERMINATION OF IMMEDIATE SOURCES OF INFECTION

In order to determine the principal immediate sources of the infection in a locality careful epidemiologic studies are necessary. Explosive outbreaks, such as those produced by highly infected water or milk, present rather characteristic features, and as a rule epidemiologic studies of these will point out quite readily

and definitely the source of the infection. But in communities where a high rate of prevalence of typhoid fever is maintained for years and is due to a number of different factors which vary in relative extent of operation from time to time, the problem becomes very intricate and its exact solution exceedingly difficult.

Studies of all typhoid fever situations, however, should be conducted along the same general lines. Hasty conclusions, based on first-glance impressions, should be avoided. Every factor possibly concerned in the spread of the infection should be carefully considered and investigated. As the facts are collected one factor after another may be eliminated, until definite conclusions may be drawn as to the principal source, or sources, of the infection.

DIFFERENT TYPES OF TYPHOID FEVER SITUATIONS PRESENTED FOR STUDY

Large urban communities in which the disease has prevailed for a long time as a rule present complex typhoid fever situations. Here the conditions of life are complex. Large numbers of all classes of people are in close association. Foodstuffs are obtained from many sources and handled by many persons. In some instances the water-supply is obtained from a number of different sources. Small communities, usually free of the disease, when visited by sudden and extensive outbreaks, present, as a rule, simple typhoid fever situations.

During the last three years as a member of a board of officers[1] detailed by the Surgeon-General of the Public Health and Marine-Hospital Service to study the origin and prevalence of typhoid fever in the District of Columbia, I have been engaged in a study of a situation of the complex type; and recently I have conducted an investigation of an outbreak at the National

1. Surgeon M. J. Rosenau, chairman; Passed Assistant Surgeon L. L. Lumsden; and Prof. Joseph H. Kastle, recorder.

Park Seminary at Forest Glen, Md., which was of the simpler type of typhoid fever situation. These two situations may be presented as a striking contrast:

THE TYPHOID FEVER SITUATION IN WASHINGTON, D. C.

Previous to 1906 there was quite a general consensus of opinion among those who had given attention to the subject that the high rate of prevalence of typhoid fever in Washington was due to the polluted public water-supply obtained from the Potomac River.

Effect of Filtration of the Public Water-Supply on the Typhoid Fever Rate.—In October, 1905, a filtration plant was completed and since then the city has been supplied continuously with filtered Potomac River water. During the winter and spring months following the installation of the sand filters there was comparatively little typhoid fever in Washington, but early in July, 1906, there occurred a great increase in the number of cases and the disease was properly regarded as prevailing in epidemic form.

This marked increase in the prevalence of typhoid fever with the advent of summer weather corresponded with the history of the disease in many previous years. The typhoid fever death rate for the calendar year 1906 was 49.3 per 100,000, while for the three years immediately previous to the filtration of the water it averaged about 44 per 100,000. Thus, the rate in 1906, the first year after the filtration of the water, was somewhat in excess of the rates of the several years previous, despite the fact that the results of the bacteriologic analyses of the water showed that the filtration accomplished a very great reduction in the total bacterial content of the applied water such as was supplied to the city during the three years previous to filtration. In 1907 and 1908, the second and third years after filtration, the typhoid fever case and death rates in Washington were lower than in any other years of which there is record The typhoid fever death rate in 1907 was 34.5 and

in 1908 36.5 per 100,000. The reduction in the rate in these two years is accounted for by the reduction which occurred in the summer typhoid. The rates in the winter, spring and fall seasons of the three years 1906, 1907 and 1908 were almost exactly the same.

An important question and one difficult to answer positively is: How much, if any, of the reduction in the typhoid fever rate in the summers of 1907 and 1908 was due to the improvement in the water-supply as the result of sand filtration? Had such a reduced rate been observed in the summer of 1906, the first year after the filters were put into operation, probably few if any would have doubted that the reduction in the summer typhoid had been accomplished by the improvement in the water supply.

Judged by bacteriologic standards we found the filtered water supplied the city in the summers of 1907 and 1908 was of considerably better quality than the filtered water supplied the city in the summer of 1906. The fact that the higher degree of improvement of the filtered water was followed by a reduction in the typhoid rate, to my mind, suggests cause and effect.

As a board we have not been able to decide definitely as to what part water-borne infection played in the causation of typhoid fever in Washington in 1906; but we are satisfied, by the results of our studies, that the Potomac River water previous to filtration caused much less of Washington's typhoid than was generally supposed, and that in the summers of 1907 and 1908 the public filtered water-supply played a relatively minor rôle, if any, in the causation of the disease.

Milk.—In the typhoid fever seasons (May 1 to November 1) of each of the three years, 1906, 1907 and 1908, we have definitely attributed about 10 per cent. of the cases originating in the District of Columbia to milk-borne infection. These cases occurred in the course of pronounced milk outbreaks among the customers of certain dairymen.

In the season of 1906 there were three such outbreaks, in the season of 1907 one, and in the season of 1908 one. The outbreak in the fall of 1908[2] was of particular interest, inasmuch as the infection was traced to a bacillus-carrier who was engaged in handling the milk on one of the farms from which the implicated supply was obtained. This woman gave a history of having had typhoid fever about eighteen years before and of having been since then in robust health.

Besides the cases which have occurred in the course of pronounced milk outbreaks we believe that there have been a number of scattering cases due to infected milk which we have not been able to trace, and we consider milk one of the major factors concerned in the transmission of typhoid fever in Washington.

Contact.—In the cases originating in the District of Columbia during the typhoid seasons of 1907 and 1908 about 20 per cent. of the patients gave a history of more or less direct or indirect association, during the thirty days previous to onset of illness, with previous patients in the febrile stage of the disease and were attributed to infection by contact.

Considering the large amount of association between persons living in a large city and the number of ways in which infection through personal contact may occur it is easy to understand that many cases in a large city may be due to infection by contact which can not be traced, and I regard personal contact as one of the major factors concerned in the transmission of typhoid fever infection in the District of Columbia.

Imported Cases.—About 24 per cent. of the cases of typhoid fever which were reported in the District of Columbia during the typhoid seasons of 1907 and 1908 were cases in which the infection had been contracted outside the District of Columbia. In the 1906 period

2. Lumsden, L. L., and Woodward, William C.: A Milk-borne Outbreak of Typhoid Fever Traced to a Bacillus-Carrier, THE JOURNAL A. M. A., March 6, 1909, lii, 749.

the imported cases amounted to about 15 per cent. of the total.

Intricacy of the Washington Problem.—A number of interesting details as to seasonal prevalence, racial distribution, relation of the seasonal abundance of flies to the seasonal prevalence of the disease, etc., have been worked out, but they are set forth in the publications[3] and enough has been cited to indicate the great intricacy of the typhoid fever problem in Washington.

There is no mystery as to why Washington has some typhoid fever, but there does seem to be some mystery as to why Washington still has so much typhoid fever. For a city having the climatic and general sanitary conditions of Washington and having no water-borne infection a typhoid death rate of 35 per 100,000 per year does seem comparatively high.

The "excessive" typhoid rate in Washington presents an interesting field for speculation, such as (1) the possibility that the public water-supply, though not distributing typhoid bacilli, does convey some other agents which have to do with the establishment of susceptibility to typhoid infection; (2) the possibility of there being peculiarly active in Washington some as yet entirely unknown agent or agents which are concerned in the dissemination of the infection.

The fact that communities which have good water, a properly safeguarded milk-supply, a good sewerage system, and in which cases of the disease are properly cared for, have little or no typhoid fever indicates either that there are no unknown agents much concerned in the spread of the infection or that the same measures which prevent the operations of the known agents also prevent the operation of whatever unknown agents there may be.

3. Rosenau, M. J., Lumsden, L. L., and Kastle, J. H.: The Origin and Prevalence of Typhoid Fever in the District of Columbia, Rep, 1, Hyg. Lab. Bull. 35, U. S. P. H. and M.-H. S., Washington, 1907 [Season of 1906]; Rep. 2, Hyg. Lab. Bull. 44 [Season of 1907]; Rep. 3, Hyg. Lab. Bull. 51 [Season of 1908].

In considering the "excessive" typhoid fever rate of Washington it should be borne in mind that climatically Washington is a southern city and that there are few, if any, cities of over 75,000 population south of Washington and east of the Mississippi river which during the two years 1907 and 1908 had typhoid fever rates as low as that of Washington.

AN OUTBREAK OF TYPHOID FEVER AT THE NATIONAL PARK SEMINARY, FOREST GLEN, MD.

In the latter part of March, 1909, an outbreak of typhoid fever occurred at the National Park Seminary, a school for young women located at Forest Glen, Md., a village about nine miles from Washington, D. C. Twenty-four cases developed.

The first patient began to have slight prodromal symptoms about March 10 and developed definite symptoms and took to bed on March 19. The last patient began to complain about April 16 and developed definite symptoms and took to bed on April 21. The occurrence of cases by definite onset of symptoms was as follows:

	Cases		Cases
March 19	1	April 9	2
March 24	1	April 10	1
March 25	2	April 12	1
March 29	1	April 13	1
April 3	1	April 14	1
April 4	2	April 15	1
April 5	4	April 21	1
April 6	3		—
April 8	1	Total	24

A fairly large proportion of the cases ran a mild course. Only one death occurred, making a fatality rate of 4.17 per cent. In the majority of the cases the diagnosis was confirmed by positive Widal test or by isolation of the typhoid bacillus from the blood, feces or urine.

Some of the students developed the disease at the seminary and others in different sections of the country to which they had gone for the Easter holidays.

Distribution of the Infection.—At the time of the occurrence of the outbreak the population of the seminary consisted of about 400 persons as follows:

Students	270
Officials and instructors	35
Employés and servants—	
White men	15
White women	35
Colored men	45
Total	400

The 24 cases were distributed among the seminary's population as follows: 20 in students, 1 in officials and instructors, and 3 in employés and servants. Thus the distribution of the disease among the three classes was quite general.

The grounds of the seminary cover about sixty acres. The buildings are all of modern construction and are kept in excellent sanitary condition. The four buildings occupied by the students are located in different parts of the grounds. The number of students to each building and the number of cases of typhoid fever which developed among them were as follows:

	No. of students.	No. of cases.
Main building	145	10
Villa	50	7
Junior building	35	3
Senior building	40	0

The three buildings occupied by employés and servants, with the number of occupants and cases to each, were as follows:

	No. of occupants.	No. of cases.
Building for white women	35	2
Building for white men	15	0
Building for colored men	45	1

Again, it was evident that the disease was generally distributed throughout the population regardless of building occupied as place of residence.

Previous Typhoid.—The seminary was established in 1894. No cases of typhoid fever developed among the

persons living at the seminary until the beginning of the school term in the fall of 1908. Then two of the students developed definite symptoms of typhoid fever, one sixteen days and the other twenty-three days after arrival at the seminary. As no other cases occurred it was presumed that probably both of these students contracted the infection before coming to the seminary.

In the summer of 1908 three cases developed among the students about three weeks after they had left the seminary and gone for the summer vacation to their homes in different parts of the country. In these cases, also, the infection may have been contracted when the young women were *en route* to or after their arrival at their homes.

Place of Infection.—The first seven cases to occur in the outbreak were all among the students. As the students made trips to Washington about twice a month and on these trips usually took luncheon in the city, the first question to arise was if the infection had been contracted at the seminary or in Washington.

As a member of the typhoid fever board of the Public Health and Marine-Hospital Service engaged in the investigation of the disease in the District of Columbia, I was aware of the rate of prevalence of typhoid fever at that time in Washington and, as the rate among the students even then far exceeded the rate in Washington, and as reference to our case cards showed that there had been no disproportionately large number of cases among persons in Washington who had taken meals at the restaurants frequented by the students, there seemed at the beginning of the investigation little room for doubt that the infection had been contracted at the seminary. The subsequent extent of the outbreak proved the correctness of this impression.

Investigation of the Outbreak.—On March 30 the typhoid fever board of the U. S. Public Health and Marine-Hospital Service was requested by the authorities of the seminary to investigate the outbreak and to

suggest corrective measures. This request was approved by the State Board of Health of Maryland, and on April 7 I visited the seminary and began the investigation.

On March 30, when first consulted in regard to the situation, however, I had advised that all milk supplied the institution be boiled or pasteurized previous to use and that the part of the water-supply obtained from a spring stream which, from its description, was considered liable to dangerous pollution, be discontinued unless this water could be boiled previous to use. The milk-supply was boiled on and after March 31; but some of the water from the spring stream was used until April 8.

At the time the investigation was begun the population of the seminary was about 150, about 230 students, and about 20 employés having left the seminary on or about April 3 and gone for the Easter holidays to various parts of the country. Seven cases of typhoid fever were then known to have developed between March 19 and April 6, five of the cases having been among the students who had remained at the seminary and two among those who had gone away.

Possible Sources of Infection.—After a careful inquiry the following possible sources of infection were found to have been common to the cases then known of:

1. Water-supply.
2. Milk-supply.
3. Bacillus-carriers among servants who prepared or handled foods.
4. Fruits and vegetables such as are eaten uncooked and other food-supplies.
5. Ice.

No raw shell-fish had been served at the seminary during the three months previous to the outbreak. So these could be definitely excluded.

Ice.—The ice had been obtained from one of the large factories in Washington and there had been no unusual

number of cases among persons in Washington who used ice from that source. So the exclusion of ice as a factor was quite definite.

Food-Supplies.—The fruits and vegetables and other food-supplies had been bought from dealers in the large markets of Washington and Baltimore; and, as there was no unusual occurrence of typhoid fever among other customers of these dealers, the exclusion of the market supplies as a factor was quite definite.

Bacillus-Carriers.—The explosive character of the outbreak argued against a bacillus-carrier being the source of the infection. It was difficult to conceive how infection from a bacillus-carrier could have been disseminated so generally throughout the seminary's population in so short a time unless the bacillus-carrier was among those concerned in preparing or handling the food in the store-rooms or kitchen from which the meals for the whole population were served. Therefore, specimens of feces and urine from the sixteen servants engaged as cooks, store-room men, dish-washers or waiters were obtained and examined bacteriologically at the hygienic laboratory of the Public Health and Marine-Hospital Service. All the specimens were negative for the typhoid bacillus.

Milk-Supply.—The milk-supply during the four years previous to the outbreak had been received from a farm in the neighborhood. The farm is located on a high hill and is quite well isolated. No history of any illness on the farm to account for the infection was obtainable. Of the twelve persons at the farm none had ever had typhoid fever, all used the milk freely, and none had been sick. There had been no recent changes made among those who collected and handled the milk. The water-supply used for washing the milk-cans, etc., was obtained from a well located on the summit of a hill. A sample of water from the well was examined bacteriologically and found to be of good quality. Thus there seemed to be no reason for suspecting the milk-supply.

One of the cases developed 22 days after the milk-supply had been boiled; which fact, though by no means positively excluding the milk, yet is some evidence against it, as the incubation period in cases due to milk-borne infection usually is considerably less than 22 days.

Water-Supply.—The water-supply was obtained from two sources: (*a*) Three bored wells, each about 90 feet in depth, supplied most of the water used for drinking. The water from these wells was examined bacteriologically and found to be of good sanitary quality. (*b*) A small creek running through the seminary grounds supplied the water used for bathing, for washing dishes, and by the students and others frequently for brushing their teeth and sometimes for drinking. This creek had its source in a spring about half a mile above the intake for the seminary's supply.

The creek was found to be quite highly polluted with human excreta. Emptying directly into it about 100 yards below the spring was the sewage from a hospital in which there were thirty to forty persons. Besides this, some of the sewage from about fifteen residences located on the water shed of the creek between the spring and the seminary's intake evidently was washed or drained into the creek. The physician in charge of the hospital stated that there had been no case of suspected typhoid fever in the hospital. In one of the houses on the water shed, however, there had been a man ill with typhoid fever in February; his excreta, after treatment with copper sulphate—probably not sufficient to disinfect them thoroughly—were thrown out into the yard. This yard is on the crest of a hill which forms one shed of the creek. A roadway and a somewhat poorly defined gully run from the side of the yard down the hill to the creek, a distance of about 400 yards. It was evidently possible that some of the excreta from this patient could have been washed by the heavy rains and melting snows which occurred in the latter part of February and early part of March down the hill and into the creek.

Bacteriologic examination of the water from the creek showed it to be highly polluted, the colon bacillus being invariably demonstrated in quantities of 0.1 c.c. Specimens of the water collected on April 9 and on April 19 were examined by the method of Hoffman and Ficker[4] and by plating on Endo's medium for the presence of the typhoid bacillus. The results were negative. The failure to find the typhoid bacillus in the water was, of course, evidence neither for nor against the presence of such organisms in this water at the time the infection was distributed.

Measures Taken to Suppress the Outbreak.—All the evidence seemed to point to the water-supply obtained from the creek as the immediate source of the infection which had caused the outbreak. The infection in the water may have come from the discharges of the typhoid fever patient or of a bacillus-carrier on the water shed. The following recommendations were made with a view of eliminating the creek water as the primary source of the infection and also to prevent the spread of the infection from such secondary sources as had arisen or might arise:

1. Water.—To discontinue immediately the use of water from the suspected creek unless it could be surely and thoroughly boiled previous to use for any purpose. To make arrangements as rapidly as possible for permanently abandoning the creek as a source of water-supply and to pipe the water directly from the spring to the seminary. Before again using the tanks and pipes through which the creek water had been distributed, to scald them out thoroughly with boiling water.

2. Milk.—To pasteurize all milk used in the seminary.

3. Possible Typhoid Patients.—To isolate immediately all persons becoming ill with symptoms suggesting the possibility of typhoid fever, and to disinfect their excreta thoroughly.

4. Hoffman, W., and Ficker, M.: Neue Methoden des Nachweiss von Typhusbacillen, Hyg. Rundschau, 1904, xiv, 1.

4. Recovered Typhoid Patients.—To have bacteriologic examinations made of the stools and urine of the persons who had had typhoid fever to determine their freedom from infection before permitting the return of such persons from hospital or home to the seminary.

5. General Precautions.—To exercise special care in disposing of sewage and garbage; to flush out the sewerage system with a strong solution of crude carbolic acid; to protect the food-supplies from flies and other insects, etc.

6. To extend the Easter holidays until April 27, so that the improvements could be made before the majority of the students returned.

Result of Carrying Out Preventive Measures.—These recommendations were made on April 7, the day of my first visit to the seminary. They were concurred in by the Maryland State Board of Health and were carried out by the seminary officials thoroughly and as rapidly as possible. The water from the creek was shut off on April 8 and the last patient to contract typhoid fever in the course of the outbreak developed definite symptoms on April 21, just thirteen days later.

A cement basin has been installed immediately below the springs, and into this the water is piped directly from the springs. Each of the springs is cement-walled. The water from the cement basin is conveyed by an iron pipe to the seminary, a distance of about half a mile.

The school term reopened on April 27 and all the students, with the exception of thirty or forty, returned to the seminary. Under the improved conditions all have remained well.

This outbreak strikingly illustrates (1) the comparative ease with which the problem of a local typhoid outbreak may be solved by careful epidemiologic studies, and (2) the readiness with which such an outbreak may be checked when the local authorities have, and exercise, the power to carry out the proper preventive measures.

ABSTRACT OF DISCUSSION

ON PAPERS BY DRS. DUTTON, STONE AND LUMSDEN

DR. W. H. WELCH, Baltimore: I should like to emphasize the importance of such prolonged, thorough, intensive investigations of the epidemiology of typhoid fever as those reported by the commission, of which Dr. Lumsden is a member, concerning the origin and prevalence of typhoid fever in the District of Columbia in 1906 and 1907. The report of the commission, consisting of Drs. Reed, Vaughan and Shakespeare, appointed to investigate the typhoid fever so appallingly prevalent in our camps during the Spanish-American War aroused attention to the importance of contact and of other sources of infection than the water in the spread of this disease, and the painstaking study of the typhoid fever of the city of Washington has still further emphasized the lesson that in the past we have often been too hasty in attributing the epidemic prevalence of typhoid exclusively to the drinking-water. The experience of Washington is particularly instructive, inasmuch as it was generally assumed before the introduction of central sand filtration in the latter part of 1905 that the Potomac River water was contaminated and was the source of the large amount of typhoid in that city. Despite an apparently admirable system of filtration, the amount of typhoid fever continued high during the summer months of 1906 and to a less extent of 1907. The evidence is strong, even if not absolutely convincing, that the drinking water at present plays no important part in the conveyance of typhoid fever in Washington, and the probability is that it never has been a significant factor there in propagating the disease, despite the almost universal professional opinion to the contrary in past years.

The experience in Washington is probably not exceptional, and it indicates the need of much more careful and detailed study of the conditions determining the occurrence of typhoid in American cities than has hitherto been customary. We should not make the drinking-water responsible for the disease without conclusive evidence. Of course, in many instances such evidence has been presented, and there seems no doubt that a large amount of the typhoid of Pittsburg, Philadelphia and some other cities is water-borne.

Although contaminated milk as a source of infection has long been known, the importance of this factor is not, I think, as yet sufficiently realized. Hitherto attention has been especially directed to explosive outbreaks occurring in the route of particular milk dealers, but there is evidence that the milk may be responsible for not a small percentage of the class of cases hitherto deemed explicable only on the assumption of a water-borne infection, that is, of the scattered and more or less uniformly distributed cases in a city, where the relation to the milk supply is not so immediately apparent. We need protection from the many and peculiar dangers of infection

from the white streams of milk which course through our cities quite as much as from the risks of contaminated water. Recent investigations have brought to the front with ever-increasing force contact or the more or less direct conveyance of the typhoid bacillus from person to person as an important mode of propagation of this disease. It is certainly disturbing to learn that the human carriers and distributors of the bacillus are not merely patients in the febrile stage of the disease but are also those incubating the disease as well as persons during convalescence or after recovery, it may be even individuals in health without a history of a previous attack of the fever. It is apparent that the occurrence of multiple cases of typhoid in a household and the demonstration of contact with a typhoid patient afford no accurate measure of the extent of danger from contact, and that the determination of the rôle played by this factor in spreading the disease is often a matter of great difficulty and requires unusually patient and careful search. Under these circumstances it is significant that about 19 per cent. of the typhoid cases in Washington in the summer of 1907 were attributed to contact. In considering the manifold possibilities of conveyance of typhoid germs we should not lose sight of the fact that the primary source of the bacilli is always from human beings, and that every effort should be made to prevent the escape of living typhoid germs from this source into the various vehicles of contagion. In conclusion, I would urge the need for other cities of such painstaking studies by skilled investigators of the modes of conveyance of typhoid fever as those conducted during the past two years in the city of Washington, some of the results of which have been presented to us by Dr. Lumsden.

GENERAL GEORGE M. STERNBERG, U. S. Army: Dr. Lumsden did not refer to one condition in Washington which I think accounts for many of the unexplained cases. In Washington we have a very good water supply and a very good system of sewers, but the sewer system is not complete. We still have a large number of box privies in the alleys and in out-of-the-way places. We have a large colored population living in insanitary surroundings. Many of these colored people are scattered during the summer months at seaside resorts. Some of them no doubt after their return develop typhoid. I doubt whether Dr. Lumsden has been able to keep track of all of these important cases in the alleys of the city. We have a good health department but, unfortunately, not a sufficient number of inspectors. Some of the unexplained cases, I believe, are due to the carrying of infectious material by flies from the insanitary alley houses and out-houses often to the better houses which have sewer connections, and are located on streets and avenues, in the vicinity of the hidden alleys. The fly was not referred to by Dr. Lumsden but it was referred to by the first speaker. It seems that our sad experience during the Spanish-American War was necessary to convince the profession in

this country of the rôle of the fly in the propogation of typhoid fever. I was convinced of this some years before the Spanish-American War, and in April, 1898, I issued a circular to medical officers of the army pointing out the dangers from insanitary camps, and especially calling attention to the danger of the transmission of typhoid fever by flies. The reader of the first paper seems to have made the discovery for himself. I think perhaps my official circulars were not read so extensively as they might have been, although most of our regular medical officers of experience were well informed on the subject, but when a lot of undisciplined troops are thrown into unprepared camps with insufficient medical officers, the result appears to be inevitable. Even when the chief surgeon is an officer of experience, he finds himself unable to cope with the situation. I fear that we might have the same result if undisciplined troops were again thrown into unprepared camps in preparation for an unexpected war. Now the remedy for this condition of affairs is proper training of volunteer troops, a thoroughly organized medical department, the prompt removal of febrile cases from the camp, and disposal of excreta by cremation whenever practicable. With a moving camp this may not be practicable, but with a moving camp there is less danger. This is one reason why the Japanese troops suffered little from camp diseases during the recent war with Russia. In the Spanish-American War our troops were assembled in camps where they expected to remain but a short time, but the majority of them were never called on to go to Cuba and remained in the camps, awaiting orders, until the camp site was thoroughly infected. One of my recommendations made at the close of the Spanish-American War was that we should have permanent camps with sewers and a pure water supply, and everything necessary for the assembling of troops in case of emergency. So far as I know, this recommendation has not yet been acted on and I fear that if we had another war and a large number of troops were called out the lessons of the Spanish-American War might have to be relearned by the officers, both of the line and of the medical department.

Dr. Henry B. Hemenway, Evanston, Ill.: The greatest obstacle to progress in the control of typhoid has been the early recognition that sometimes typhoid was spread by water. It is familiarly called a water-borne disease. It has been impressed on me very emphatically, of late, that milk is far more liable to give the disease than is water. The typhoid germ, if I am not mistaken, does not thrive in water. In water it is a weakly germ, which cannot so readily multiply; but in milk it may multiply under exactly the same conditions, because it gets more nutriment. The great problem to-day seems to be the control of what is familiarly called the typhoid bacillus-carriers. That is a problem on more than one account. In the first place, a large number of these individuals are not suspected of being bacilli-carriers. There has been no sys-

tematic effort on the part of health departments to keep track of every typhoid case until it is known that the patient no longer excretes the typhoid germ. I can recognize the fact that it would be a hardship on the community, and especially upon the individual, if every typhoid patient were kept, as we might say, in quarantine, using that word even in a very broad sense; but it seems to me that certain laws should be passed which would give a supervision of all bacilli-carriers. Diphtheria presents a similar problem. I had an instance within the last six months; the bacillus-carrier, a woman perfectly well and strong, absolutely objected to being restricted. She happened to be a diphtheria carrier. A number of cases of diphtheria were shown in a certain territory occasionally cropping out; and the thing was to find where the infection came from. Finally, it incidentally came to the knowledge of some that there was a particular fruit peddler going through that territory who himself was well but had had a case in his family which was suspiciously like diphtheria. The typhoid carrier is particularly dangerous whenever he comes in contact with any food which others will eat without further cooking. The typhoid carrier should by law be restricted from any employment on milk farms; he should be restricted from employment in a bakery, or in a grocery, or in any such place.

DR. JUAN GUITERAS, Havana, Cuba: I have had no special experience with typhoid fever from the point of view of the public health officer. We have little typhoid fever in Havana. Our water supply is excellent, coming direct from abundant springs. The milk used in Cuba is always boiled. No raw milk is ever drunk in Cuba. Perhaps for those two reasons typhoid fever is limited there. The tracing of contact relations in the few cases that we do have in Havana is usually not difficult.

DR. A. C. ABBOTT, Philadelphia: Coming from a community in which the average incidences of typhoid fever has been for years approximately 6,000 cases annually, it is not unlikely that some at least of our experiences may prove to be of service. In the beginning, I should like to subscribe to that which has already beeen said by Dr. Welch concerning the instructive work of the Washington board of which Dr. Lumsden is an active member. It has brought out in an impressive manner the complicated nature of the problem of typhoid fever as it effects a community, and has left no doubt in the minds of those familiar with it that no stone should be left unturned in seeking for the causes of endemicity of typhoid fever. It also demonstrates that conclusions drawn for one community may not of necessity be applicable to others. You have heard what has been said concerning Washington. In Philadelphia there is no reasonable room for doubt that our principal trouble lay in the filthy, grossly polluted drinking-water with which our city until very recently was supplied. With the introduction of proper methods of purifying that water, the

occurrence of typhoid fever immediately lessened by about 80 per cent., and we believe that with the continuance of the purifying methods and the further extension of the system that this reduction will be still greater reduced. There is no doubt that many cases in the city arise from the use of specifically infected milk, but I would hesitate to form an estimate of the proportion of these cases, for it would be nothing more nor less than guess work. On several occasions we have, it is true, succeeded in tracing to their origins some isolated outbreaks of the fever due to contaminated milk. Two of these are so instructive and worked out with such mathematical percision that I am tempted to relate their main points:

One outbreak occurred in one of the lower wards of the city and involved over fifty persons. Without entering into the details, it will suffice to say that on investigation the milk purchased by these individuals was found to have come from a farm on which about three or four weeks prior to the outbreak there had been in a family of seven, five cases of typhoid fever, the two remaining members, the wife and a little daughter, having charge not only of the patients but likewise preparing the milk for market. The bedpans used by the patients were washed on the back porch immediately over the spring used for rinsing the milk cans. The next outbreak involved a number of students at one of the colleges in Philadelphia. In this instance we found the milk being supplied to have been produced on a farm where inspection showed everything to be in a satisfactory condition. It was, however, handled by a middleman and in looking into affairs at his place we found that the milk was being bottled from the cans by means of a rubber syphon. His two sons sucked the milk up from the can with an ordinary piece of rubber tubing and allowed it to flow into the bottle. One of these sons within a day or two was taken to the hospital ill with typhoid fever, and in less than a week the second was also sent to the hospital with the same disease. That experiences of this kind are to be had in every community I have no doubt.

With the contact cases we have a much more difficult problem. Of course, the obvious contacts we exclude from our consideration but that there is a subtle dissemination of the disease through ways of contact not obvious I have no doubt whatever.

A great difficulty in satisfactorily tracing out completely the dissemination of this disease lies in the almost impossibility of securing uniformly correct histories. It is astonishing how few apparently intelligent people can answer no questions in such a way as to aid you. Many do not seem to have the least recollection of where they have been or what they have done during the incubation period of the disease. Others make statements that are intentionally misleading, I am sure.

Another difficulty that is common to most communties is incorrect diagnosis. We have repeatedly had reports come to

our office of persons having typhoid fever at such and such an address. Often in less than a week from the onset of the disease these persons are attending to their ordinary avocations.

Until there is some concerted action concerning the control of water courses the municipal problem of typhoid fever is going to be very largely a water problem.

It is needless for me to mention the variety of other ways in which the disease may be disseminated, such as by insects, by vegetables grown in land fertilized with human manure, by shell-fish taken from polluted waters, etc.

DR. LISTON H. MONTGOMERY, Chicago: Perhaps raw oysters and other shell-fish have something to do with the dissemination of typhoid fever in the cities on the coast. In Chicago the people cannot all afford these luxuries. It is well known that the dissemination of typhoid is due to the house-fly and the fruit, or pomace, fly, roaches, etc. Weeks ago our Commissioner of Health issued a bulletin instructing housewives on the necessity of placing in windows wire screens, so as to prevent flies from entering the house and contaminating the food. In some of the cities, as I understand it, active war has already been begun for the extermination of the house-fly. Bacteriologists who have captured flies in the houses stained these insects, as I understand it, with a brilliant dye and released them, watching the flies afterward by following them and seeing that they reveled in filth boxes, garbage, etc. Later these same flies returned to the houses where they were previously captured and stained; then, before they had time to contaminate food, they were recaptured and their excreta, or contents of their alimentary tract, were investigated and were found to contain the bacteria, not only of typhoid, but of various other diseases.

In one of the larger towns in the East a householder, having recovered from typhoid fever proved to have been contracted, I understand, on account of the polluted stream that went through the town, instituted a lawsuit against the town and, I believe, recovered damages by judgment.

DR. SENECA EGBERT, Philadelphia: One other source of infection has not been mentioned to-day, and I am rather surprised thereat. It is not a proved source, but it seems to me a very possible one. I refer to celery, lettuce and other articles of food which come to us in the fresh, green state. I have in mind three instances which seemed to me to help make that a possibility. One case was that of the small child of one of my colleagues, in whose home I can vouch for extraordinary care as to typhoid infection. The little girl had a serious case of typhoid; and in the minds of her parents the only thing that could have caused it was celery, of which she was very fond and which they used very largely in the household.

Some years ago members of one of the improvement associations in the northern part of Philadelphia came to me and

asked my opinion as to the use of night-soil from old privy vaults on the truck farms in their neighborhood. They declared it a common practice of these farmers to use night soil on these farms. I saw an Italian picking watercress from a little stream which was close to the ends of the ties of the railroad track and which could readily have been polluted and infected by a typhoid carrier on a passenger train. So it seems to me entirely possible that a number of cases may occur in this way through infection from such articles of food as are consumed in the fresh, green state and which cannot, so far as I know, be sterilized and made free of the germ, once they are contaminated.

I am glad to testify that Dr. Abbott has been one of the factors in Philadelphia which have brought about that elimination of a large proportion of our typhoid cases and which we are very glad to have eliminated. The sources of the others may continue to puzzle us for some time to come, but must eventually be discovered and eliminated.

This problem is a very complex one, demanding the attention of every sanitarian. For a long time I have felt that it is just as important a problem as tuberculosis; while the incidence and the death rate from typhoid may not be so high as in the case of tuberculosis, I think a crusade against the former carried on with the same vigor and the same widespread effort the country over as that against the latter would result in a much greater diminution in death rate and incidence than the tuberculosis crusade can possibly hope to achieve in anything like the near future.

DR. J. N. HURTY, Indianapolis: Other theoretical sources, and we now think practical sources, of typhoid fever, are public lunch wagons, public fruit stands and candy wagons. My attention was directed to this by a newspaper man. A reporter was taken ill with typhoid fever; and the man who made his rounds, afterward talking on the subject to me, said: "I don't know where he could have gotten it; unless from one of those lunch wagons." Then a policeman who frequently patronized the same lunch wagon was attacked with typhoid. Investigation showed that the lunch man had typhoid in his family; so, of course, there was the source, and it is comparable to the restaurant source.

In regard to the spread of typhoid fever by contact: The Indiana Soldiers' Home at Lafayettte is beautifully situated. The sanitation is very good. There was no typhoid there—had not been for years. The commandant's son came home with typhoid from school. The chief physician of the institution attended him, and presently the disease spread all over the institution. There were 65 cases and 1 death. After a thorough investigation showing the deep well-water to be pure, the sewage perfect, and all that, we found that the physician spread the infection all through that institution. He came down with it himself and was very ill—so ill that he was de-

lirious while the investigation was being made. We asked him what precautions he took after he handled the patient; what precautions he took in regard to washing his hands, and he said he did not take any. "Did you wash your hands?" "Well, sometimes I did and sometimes I did not." In this instance 65 patients were infected by the physician himself; not all of them, of course, but he started the infection. So a physician may be a distributing agent.

DR. HENRY B. HEMENWAY, Evanston, Ill.: I have long been accustomed to use a little coverette on my thermometer, so that the thermometer never touches the patient. It seems to me that is a precaution that might well be used in such cases.

DR. A. W. FREEMAN, Richmond, Va.: We have had in Richmond, and later in Virginia at large, an interesting experience with typhoid. The Richmond investigation was begun independently of the Washington work, and the results were in perfect accord with those arrived at in Washington. The parallelism between the typhoid rates of the two cities, as has been pointed out elsewhere, is remarkable. We were able, also, to account for about the same percentage of cases, leaving the larger number of cases without explanation. In July, 1908, the newly reorganized state department of health began a similar investigation of the small, local outbreaks in Virginia, believing that these, offering less complicated situations than the outbreaks prevailing in the larger cities, would throw more light on the problem. The results of this investigation were varied. Of about thirty outbreaks investigated a few were apparently caused by water, but by far the larger number of cases in the smaller towns could be traced to the carrying of the infection from house to house by food, or by the visits of neighbors entering the sick-room. Even the most casual contact might, apparently, be responsible for the spread of the disease.

This year we hope to investigate the true rural typhoid; typhoid on the farm, where the whole process of spread can be seen plainly. On the average Virginia farm you can follow the movements of every member of the family for weeks and even months prior to the outbreak, and we have already followed out a number of these cases, where the disease could be traced from farm to farm, over long distances. We believe that this type of the disease offers a particularly inviting field for investigation. We believe strongly in the contact idea as applied to typhoid in Virginia. We have no opinions to offer as to typhoid in any other locality, but so far as our present experience goes we do not believe the farm well to be responsible for any great number of cases. It is the contact of the well person with the patient that results in the spread of the disease in Virginia.

DR. F. F. RUSSELL, U. S. Army: There is another way to prevent typhoid fever besides tracing down the source of in-

fection and destroying that source, and that is, by vaccination, or inoculation or immunization of a body of men. While this is not a practicable matter for civil life within any large limits, it is within the military service, and the surgeon-general of the army has now started to immunize large bodies of troops against typhoid. The British and German campaigns against typhoid fever (which are conducted as our own, with the idea of preventing infection from every possible source and without neglecting any other means which will help us in stamping out typhoid) have shown that vaccination against typhoid undoubtedly does protect and that it protects for a considerable length of time. The figures of the British (which have recently been published and which have been mentioned by Dr. Stone) show very roughly that among those men who have been vaccinated there is only one case of typhoid to every ten cases among men equally exposed who have not been vaccinated. Now that result is sufficient to encourage us in the use of vaccination among all persons who are to be exposed to typhoid. Going into a camp is equivalent to going into an endemic area, for typhoid prevails everywhere in the United States; and we cannot organize a camp or assemble any large number of men without having typhoid introduced inside of three weeks. The disease will spread by contact, almost altogether by contact, and contact in a camp is much more intimate than in civil life, so that the dangers which are present everywhere are present in a much greater degree in camp. We feel that not only must we provide pure water and pure food, and destroy the excreta, etc., of everyone, but we must also vaccinate everyone who can be persuaded to take it as an additional means of reducing the morbidity and mortality from this disease.

DR. JAMES B. BULLITT, University, Miss.: In my town (population 2,500), cisterns, shallow wells and privies were in use until about ten years ago. On the installation of a sewerage system and of a water supply from artesian wells, typhoid, which had been fearfully prevalent, practically disappeared. There is one block, however, occupied for the most part by the better class of people, where the configuration of the ground prevented junction with the main sewers. A short sewer was therefore laid emptying into a little ravine only a few rods away. The water supply is the same as for the rest of the town. Here several cases of typhoid have occurred every year, though the rest of the town has remained practically free. As there have been several intervals of eight or ten months between consecutive cases, it seems unlikely that each crop has developed from those immediately preceding. It is my opinion that some bacillus-carrier, whom we have been unable to identify, lives on that street and intermittently infects the ravine, from which doubtless flies and other insects carry the infection to the neighboring houses.

DR. GARDNER T. SWARTZ, Providence, R. I.: In Providence, when an epidemic breaks out in a quarter, the health officer is called on to put his finger on the source; if he cannot he is not a master and cannot hold his position. The public is now becoming informed of these matters and the possibilities that we have of determining the various sources of this disease. We must encourage our departments, both state and national, in the promulgation of this investigation work, and urge that the laboratories must be so situated, and of such convenient distances, that we shall be able to utilize them for carrying out the study of this disease, concerning which on many occasions we must acknowledge our impotence.

DR. MARTIN FRIEDRICH, Cleveland, Ohio: These discoveries of new carriers of typhoid fever germs are not only interesting but of great importance but let us remember that in the main typhoid fever is a water-borne disease.

DR. H. M. BRACKEN, St. Paul, Minn.: We had a beautiful opportunity to study typhoid in Minnesota in a little town where we told them they were going to have it; and we got the first case. A short time ago my attention was directed to a farm where the residents were man and wife, and where every employee for the last seven or eight years who has come onto that farm has had typhoid fever. I asked if either of the members of the family had had the disease and I was told by the physician no; but when we sent someone to find out, we found that the wife had had typhoid several years ago.

DR. W. FOREST DUTTON, Walkers Mills, Pa.: When I prepared this paper I expected critical discussion, and earnestly desired it, for my own personal edification more than anything else. The technic was not different from that used by bacteriologists. Precautions were taken to eliminate other than the *Bacillus typhosus* of Eberth. When I say typhoid, I mean, distinctly and absolutely, the bacillus of Eberth and not paratyphoid, colon, or the paracolon bacillus nor intermediate species. I used culture media most suitable to the individual case. It is truly a difficult task requiring ofttimes months to secure positive results. It has been known for years that typhoid bacilli reach the blood through other than ordinary channels. In the first two weeks of typhoid there is a marked blood infection; the bacilli occur in the tissues in clumps, and the roseolæ contain bacilli. Bacilli are frequently found in urine, feces, bile, and pus, years after primary infection. Thence, it can easily be inferred how the infection is accessible to the insects referred to in my paper. The proofs that have been furnished by Grünbaum and Sanarelli prove the specific character of typhoid.

In reference to typhoid commissions, I would say that a great deal has been accomplished by their efforts, yet salient

etiologic factors are frequently overlooked. A general survey is made of epidemic and endemic outbreaks of typhoid, and general data are accumulated. The fact remains, however, that a commission cannot study individual cases as affecting rural districts, and this, perhaps, accounts for failure to learn the source of infection.

In closing, I should like to say that vaccination against typhoid will, when the method is perfected, prove one of the greatest boons to the human race, second only to vaccination against smallpox.

DR. L. L. LUMSDEN, Washington, D. C.: It is a great pleasure to see such a keen interest taken in the typhoid problem. The many valuable suggestions made in the course of the discussion I am sure will aid us in our future work in Washington. At the beginning of our studies in Washington we suspected that there might be many cases of typhoid which were not reported and which might constitute some of the undiscovered links in the chain of transmission of the infection by contact. In the summer of 1908 we conducted a house-to-house canvass in 32 city blocks having a population of about 6,000. The results of this canvass incline us to believe that in Washington more cases of typhoid are reported than exist in a clinical sense.

As Dr. Welch remarked, I probably did not sufficiently emphasize the milk problem. The pronounced milk outbreaks in Washington may be regarded somewhat as acute exacerbations of a chronic affection. A number of scattering cases doubtless are due to milk-borne infection which cannot be traced. In our reports charts are presented which show the occurrence of typhoid cases among customers of different dairymen proportionate to amount of milk sold. One dairyman who sterilizes bottles and cans and pasteurizes milk has had among his customers a consistently low typhoid rate. This is significant and perhaps indicates what would be the result of the pasteurization of Washington's general milk supply.

There are now in the District of Columbia only about 3,000 privies. We expect to find a higher rate of prevalence of typhoid in the sections largely provided with privies; but we were disappointed and we have not been able to say as harsh things about privies as we had hoped. It is true that there are in Washington insanitary alleys having a crowded negro population, but we have found that the prevalence of typhoid in these alleys is no greater than in the better sections of the city. We have given considerable attention to flies. No preponderance of cases has been found among persons living in unscreened houses and among those whose occupations exposed them unduly to flies. Last summer Dr. L. O. Howard, at our request, made a study to determine the seasonal abundance of flies in Washington. The lack of parallelism between the

curve showing the seasonal abundance of flies and that showing the seasonal prevalence of typhoid opposes the view that flies are a major factor in the transmission of typhoid infection in Washington.

It is encouraging to hear from Dr. Guiteras that there is very little typhoid in Havana. Havana is distinctly a tropical city, having the year round about the same climate that Washington has during the summer, Washington's typhoid season. It seems that, regardless of climate, localities having good water, good milk, good sewage disposal and in which typhoid patients are properly cared for have as a rule little or no typhoid.

PREVENTION OF MALARIA

SEALE HARRIS, M.D.

Professor of Practice of Medicine and Clinical Medicine in the Medical Department of the University of Alabama; Visiting Physician, City Hospital

MOBILE, ALA.

Statistics show that malaria prevails in every state in the union except Wyoming; but because of climatic, meteoric and geologic conditions favorable to the growth of the anopheles mosquitoes, the southern states and the states adjacent to the Mississippi, Missouri and Ohio rivers show the greatest mortality from the disease.

Statistics compiled from the last census[1] show that there died, from malaria, in the United States in the year 1900, 14,909 persons, distributed by states as follows:

Alabama	1,055	Maine	16
Arizona	17	Maryland	131
Arkansas	1,730	Massachusetts	70
California	119	Michigan	168
Colorado	21	Minnesota	9
Connecticut	110	Mississippi	983
Delaware	19	Missouri	965
Dist. of Columbia	63	Montana	5
Florida	366	Nebraska	32
Georgia	1,011	Nevada	10
Idaho	4	New Hampshire	18
Illinois	497	New Jersey	110
Indiana	340	New Mexico	89
Iowa	84	New York	308
Kansas	261	North Carolina	527
Kentucky	344	North Dakota	4
Louisiana	1,030	Ohio	156

1. Twelfth Census of the United States, 1900, Vital Statistics, Vols. 1 and 2.

Oklahoma	134	Utah	6
Oregon	23	Vermont	9
Pennsylvania	140	Virginia	409
Rhode Island	24	Washington	13
South Carolina	749	West Virginia	34
Tennessee	987	Wisconsin	5
Texas	1,331	Wyoming	0

Of those who died from malaria in 1900, 9,320 were white and 5,589 colored. In the last census the colored population was approximately one-ninth of the whole, while more than one-third of the deaths from malaria were among the negroes. This high death rate from malaria among the negroes, who were formerly supposed to be more or less immune to the disease, may be accounted for by the fact that the negro population, in the states showing a high death rate from malaria, is large, and the negroes, representing the laboring and poorer classes, live in insanitary surroundings and, either from poverty or neglect, do not take treatment for the disease.

I have seen anopheles mosquitoes breeding in Central Park in New York; I have seen the plasmodium of malaria in blood obtained from the child of a millionaire residing on Fifth Avenue, and it is the same variety of mosquitoes, and the same type of protozöon, that I have seen in the swamps of the rural districts of the far south.

The problem of malaria, since it affects all sections of our country and all races and classes of our citizens, is a national one, and I shall discuss it from that point of view, though I admit that the section of country which I represent is vitally interested in this subject. In this connection I submit a few paragraphs from my address[2] as chairman of the section on medicine of the Southern Medical Association, delivered in Atlanta last November.

2. Harris, Seale: Some Problems in Medicine which Affect the Prosperity of the South, Jour. South. Med. Assn., April, 1909.

Perhaps the most important health problem which affects the prosperity of the south is malaria. One has but to travel in the eastern, northern and western states to find that in those sections the south is regarded as a hotbed for malaria. No doubt thousands of settlers have sought homes in the west and elsewhere in preference to the south, because they feared to take their families to a section which they considered so unhealthful. Many travellers avoid the south, and capitalists have been deterred from making investments in our section because of the fear of malaria. I realize that such impressions are largely due to prejudice and to ignorance of the health conditions of the south, but it is also true that we have more malaria than we should have because, with our present knowledge of the disease, it should soon be stamped out of our towns and cities and made a rare disease in the country. . . .

I have not statistics to show how much malaria has decreased in the south in the past two or three decades, except in the state of Maryland,[3] but its prevalence has been wonderfully lessened and it has become a much milder disease, so that to-day the severe types are rarely seen.

The south is enjoying splendid prosperity in all lines, and she should erase from her fair name the blot of malaria, because it is a disease which can be prevented, and which interferes very materially with her industrial development.

Malaria destroys more lives every year than have all the epidemics of yellow fever in the past half-century, and there are several millions of our citizens in the United States to-day whose wage-earning capacity is limited because of the mild and chronic forms of the disease; yet malaria is preventable, and quinin is a specific for the disease.

In my opinion, malaria is a much more serious disease than yellow fever for the reason that one attack does not confer immunity, as in yellow fever, but predisposes to subsequent attacks; and because malaria is considered such a mild disease it is not properly treated and often assumes a chronic form which saps

3. Thayer, W. S., and Hewetson, J.: The Malarial Fevers of Baltimore, Johns Hopkins Press, 1895, Baltimore. The Present Decline of Malaria in Maryland, Maryland Med. Jour., 1905, xlviii, 289.

the vitality of the individual, thereby rendering him more susceptible to all other diseases, which are made more serious by the complication of malaria. The effects of yellow fever are soon over, while the victim of malaria may have the disease for years. I believe that the high death rate from nephritis in the southern states may be largely accounted for by chronic malaria.[4]

The existence of a few cases of yellow fever in a city causes a panic which destroys its commerce; there is an exodus of a large portion of its population, and cities, states and the nation will spend thousands of dollars in quarantines and in stamping out the disease; yet in the same city there may be thousands of cases of malaria —nothing is thought of that—and there has never been any organized effort to stamp out malaria because its ravages are "seen so oft" and we are so "familiar with the monster's face" that we endure it as if conditions could not be remedied.

Both malaria and yellow fever are transmitted by mosquitoes, the only difference being that they are carried by different varieties of mosquitoes which breed under different conditions: the anopheles breeding in puddles, undrained ditches, swamps, and in the scum on the surface of stagnant and slowly moving water along the banks of rivers and small streams, while the *Stegomyia calopus* has its habitat in the standing water of old cans, bottles, gutters of houses, badly drained sewers and other water-containers in and around human habitations. The anopheles must be infected by biting a malarial subject just as the stegomyia must get the infection from man. Since the above facts regarding the transmission of yellow fever and malaria are true, it would seem that the same measures should be employed in stamping out malaria as were used so effectively in stamping out yellow fever in Havana and in

4. Marchiafava and Bignami: In Twentieth Century Practice of Medicine, New York, 1900, William Wood and Company.

the Canal Zone. According to Colonel Gorgas,[5] the mosquito crusade in Havana not only freed that city from yellow fever for the first time in more than a century, but practically eradicated malaria at the same time. The number of deaths per year from malaria, in the city of Havana, before American occupation, averaged 350; after three years of sanitation by Colonel Gorgas and his assistants the deaths were reduced to 40 per annum.

That malaria may affect the welfare and destiny of nations is shown by the fact that students of history believe the decadence and downfall of ancient Greece and Rome was, to a great extent, due to the life-and-energy-sapping disease—malaria.[6] They believe that malaria is largely responsible for the transformation of the most learned, cultured and physically the strongest race of people in the history of the world into the ignorant and morally and physically degenerate people who to-day live among the ruins of Greece, which is now regarded as a "death hole for malaria."[7] The writings of nearly all the Roman authors contain many references to severe and destructive epidemics of malaria, and the efforts to drain the deadly Campagna date back before the time of the Cæsars. The prevalence of malaria in Italy no doubt had much to do with breaking the spirit of the ancient lordly Roman, "who was greater than a king," and thus helped to bring about the decline and downfall of the Roman empire.[8]

In the earliest years of this republic, and even in the first few decades of the last century, malaria was prevalent in the southern states to an extent which greatly interfered with their development. At that time quinin

5. Gorgas, W. C.: Malaria in the Tropics, THE JOURNAL A. M. A., 1906, xlvi, 1416.

6. Jones, Ross and Ellett: Malaria: A Neglected Factor in the History of Greece and Rome, 1907, Cambridge.

7. Ross, R.: Malaria in Greece, Jour. Trop. Med., 1906, ix, 341, 351.

8. Jones, W. H. S.: Malaria and History. Ann. Trop. Med. and Parasit., 1907, i, 529-546.

was such a rare and expensive drug that it could not be obtained, particularly in the rural districts, and nothing was known as to the nature and cause of the disease, so that thousands died from the malignant types of malaria.

The first capital of Alabama, St. Stephens, which, at one time, in 1810, was a thriving town of several thousand people, was literally wiped off the earth because malaria was so prevalent and of such severe type that its inhabitants either died or abandoned their homes. With our present knowledge of malaria, the inhabitants of old St. Stephens could live in perfect health, without one of them having a symptom of the disease which a century ago destroyed their prosperous little city.

Malaria was the principal obstacle to the completion of the Panama Canal by the French; and I may add that it has been the cause of the failure of many smaller enterprises in our own land.

Now let us consider the question of how malaria affects the prosperity and happiness of our nation to-day. I will first discuss the question of what malaria costs the United States, of how much money is spent each year because of the ravages of this now mild and easily preventable disease.

According to the census for 1900, there died from malaria in the United States 14,909 persons, and, estimating the value of a human life at $3,000 (the legal estimate is $5,000), malaria costs our nation from loss of life alone $54,727,000 each year. The death rate from malaria is very low; probably not one out of 500 people affected dies from the disease, and, adding to the death losses the loss of time and decreased earning capacity of the millions in the United States who are afflicted with the chronic and mild types of the disease, and the money paid out by the people in quinin and other medicines, to say nothing of the doctors' bills, on account of malaria, the cost of malaria to our country is enormous and astounding.

Dr. Albert Woldert, of Tyler, Texas, in a paper[9] read before the Texas State Medical Association, gives statistics from the hospitals of the United States Army posts in Texas in the year 1901, showing that one person in seven residing in those posts had malaria at some time during the year; and, according to his statistics from the railway hospitals, located in all sections of Texas, one railroad employé out of every four had malaria. Dr. Woldert states that about 3,000 people die annually from malaria in Texas, and he estimates that the financial loss from malaria to the people of the State of Texas during the year 1901 amounted to the enormous sum of $5,333,320. If it cost Texas that sum, the loss to the United States is at least $50,000,000 to $100,000,000 per annum. These figures give what malaria costs in cold cash, and do not take into account the sorrow and suffering of the millions who are afflicted with this preventable disease.

Is it worth while to combat, and to hope to exterminate, a disease so widely prevalent in the United States?

In answer to this, I would point to what has been accomplished by the Italians in the last five years. Though Italy has suffered more from malaria than any other nation, it should be said to the credit of her physicians that they have studied the disease most carefully and have contributed more than those of any other nation to our present scientific and practical knowledge of malaria. The Italian Society for the Study of Malaria has made most valuable contributions to the science and literature of the disease. The Italians have also made practical use of their knowledge of malaria by aiding the physicians in their campaign against the disease, and even though in financial difficulties Italy has spent millions of dollars to prevent the disease. She not only enacted and enforced laws to stamp out malaria, but

9. Woldert, A.: Malarial Fever, Its Expense to the People of Texas, Transactions of the Medical Association of Texas, 1904, pp. 37-61.

went into the manufacture of quinin, selling it to her citizens at the cost of production and giving it free to her poor. That this expenditure of money and the campaign against malaria as made by the Italian government and its physicians was wise is shown by the result. The mortality rate from malaria in Italy for the past five years has been reduced two-thirds (Thayer). Think of the saving of lives and suffering to the people of our country if our mortality and morbidity rates from malaria can be reduced even two-thirds!

The results in the mosquito crusades in Havana and in the Canal Zone should encourage us. As I have said, malaria was practically exterminated in Havana, and the following extract from Gorgas' last report[10] shows how malaria is being conquered in the Canal Zone under the most favorable circumstances:

> In 1906 we had from malaria 233 deaths; in 1907, 154 deaths; and in 1908, 73 deaths. That is, with a force more than one-third larger in 1908 we had from malaria less than one-third the deaths that we had in 1906. I consider malaria the best measure of the sanitary work done. In 1906, out of every 1,000 employés we admitted to our hospital, from malaria, 821; in 1907, 424; and in 1902, 282. That is, we now have only about one-third the amount of malaria among our employés as we had three years ago.

President Taft, in a recent address, said: "The sanitation of the Canal Zone has made possible the completion of the Panama Canal, the greatest enterprise in the history of the world."

Colonel Gorgas, in an address before the Academy of Medicine in New York, said: "With the removal of yellow fever, malaria and other tropical diseases, the tropics will become the centers of civilization of the world." If it is possible to eradicate those diseases from the tropics—and medical science has practically eliminated yellow fever from the diseases to be considered—how much simpler and easier will the problem be in the

10. Gorgas, W. C.: Annual Report of the Department of Sanitation of the Isthmian Canal Commission for the Year 1908. Government Printing Office, Washington.

United States! It seems almost as feasible to stamp out malaria as yellow fever, and I believe that, with our present knowledge of the disease, it will soon become one of our rare diseases and that it will not be many years before our public health authorities will quarantine against malaria as we do now against yellow fever.

In discussing methods for the prevention of malaria, it may be well first to state the precautions to be used with an infected individual, which are largely the same as with a case of yellow fever, i. e., he should be (a) isolated (placed under a mosquito-net or in a screened room) to prevent his infecting anopheles mosquitoes; (b) the mosquitoes in the house should be destroyed by burning sulphur or pyrethrum; (c) the persons in the house or others exposed to the bites of infected mosquitoes should have preventive doses of quinin (3 grains, morning and night); (d) after the patient has been relieved of all symptoms he should take six grains of quinin a day for a period of at least three months, to be certain that he can not infect the anopheles mosquitoes in his community (Thayer).

Malaria should be classed as a reportable disease. Physicians should be required to report to the city and county health officers the name and location of each patient suffering from malaria, just as is now done with yellow fever and typhoid; and, as in those diseases, the source of infection should be searched for and removed if possible.

To protect the inhabitants of a community, whether in the city or in the country, efforts should be made to destroy all anopheles mosquitoes. Every accumulation of stagnant water, whether large or small, which can become a breeding-place for mosquitoes, should be drained or filled in, or oiled, when those measures are not practicable. The débris, green moss, and decaying vegetable matter on the surface of the water along the banks of slowly running streams should be removed be-

cause that is a favorite place for the breeding of anopheles mosquitoes.

When it is not possible to destroy all mosquitoes in any community, every person should sleep in screened rooms, or under mosquito-nets, from early spring until the mosquitoes are destroyed by the frosts of winter.

In badly infected communities (malarial localities) every person should take prophylactic doses of quinin during the summer and autumn months.

A physician in performing his daily duties can do great good by treating each malarial patient as if he had any other infectious or contagious disease, and by instructing his patrons as to the mosquito origin of malaria. He should inform his patients that malaria is infectious and of the methods to be employed in preventing its spread.

There should also be carried on a systematic campaign of education among all classes of people, by means of lectures and by widely distributed tracts, written in popular style, regarding the mosquito transmission of malaria and of how the disease may be prevented, because without the cooperation of the public a crusade against any disease can accomplish but little.

There should be organized a national association for the study and prevention of malaria, just as was done in Italy, with auxiliary state and county societies in the sections most infected.

The medical societies and boards of health in each town, city, county and state affected should take up the work of stamping out malaria. The American Medical Association, and particularly the Section on Preventive Medicine and Public Health, should aid in this great work, at least, by lending its influence toward a practical solution of this problem.

The United States Public Health and Marine-Hospital Service should also be called on to assist in stamping out a disease which causes so many deaths and so much suffering. Malaria is of more importance to the

welfare of our country than yellow fever, and the scope of the United States Public Health and Marine-Hospital Service should be enlarged and its force increased so that a trained body of sanitarians can be employed in the fight against malaria just as has been done in epidemics of yellow fever. Malaria may be at times an interstate disease and already the health officer of Mobile is protesting against the introduction into that city of severe cases of malaria from the tropics.

Congress should be urged to create a special commission for the study and prevention of malaria, and to provide an appropriation sufficient to carry on the work. It seems to me that, at this time, a separate commission could accomplish more than by placing the work in the hands of any of the departments of the government now existing, because such a commission could be composed of physicians of wide influence in the localities most affected, men who would be especially interested in getting results and men who could enlist the active cooperation of the various county and state boards of health. The physicians composing such a commission should have hospital facilities for the study of the disease, because there are many problems connected with malaria which have not been worked out.

Congress has appropriated money for the study and prevention of yellow fever. Malaria is a similar disease, and, in my opinion, is of greater importance, certainly, at this time, to the welfare of the entire nation, than yellow fever ever will be again. Congress appropriated $50,000 for the study and prevention of the boll weevil and also considerable money for destroying parasites in wheat and corn; it has given large sums for stamping out diseases in cattle; why should it not be called on to aid in stamping out a distinctly preventable disease, which destroys thousands of human lives and decreases the earning capacity of many hundreds of thousands of American citizens?

The problem of the prevention of malaria means much to the southern states and, therefore, much to the nation. If our section can be freed from malaria, the poor whites and negroes will be stronger physically and, therefore, better laborers; our naturally fertile lands will become more productive; the cotton mills will come to our cotton fields because of our cheap and efficient labor; our iron and other mineral resources will be developed to an extent hitherto not dreamed of, and our Gulf and Atlantic cities will become shipping and manufacturing centers of great importance. If we can prove to the world that malaria, like yellow fever, can be forever stamped out of the south, our prosperity will amaze the world.

ABSTRACT OF DISCUSSION

DR. MARSHALL LANGTON PRICE, Baltimore: There is one subject on which I think I ought to dwell, especially because of its importance; that is, the actual value of the statistics of malarial fever. I doubt very much, under present conditions, that 80 per cent. of the deaths which are actually recorded from malaria in the United States are due to any infection from the malarial parasite: I believe this, from my experience in Maryland, in which state there are probably recorded annually from 8 to 10 deaths from malaria. This makes an impressive showing in figures; but when the original certificates are examined one finds about as follows: returned as the primary cause of deaths, malaria, 2 weeks; intestinal perforation and peritonitis, 10 days. Analyze the death statistics of any state and similar conditions will be found. Outside of the extreme southern states there are not more than 100 deaths from malaria during the year, in the states north of Tennessee. Of over 400 deaths reported in Illinois, I doubt very much if 20 were due to malaria. During the Spanish-American War some observer made a tour of the military camps. He found from 50 to 100 men in each camp laid up with malaria and being dosed with quinin. He was told: "They have malaria." He reached some regimental surgeon, who, I am sorry to say, for the sake of Americans, had a very strong German accent. The observer asked: "How many cases of malaria have you?" He said: "Not one, sir!" His patients were not being dosed with quinin; they were being treated on rational grounds for typhoid fever. In Maryland one of the best studies of typhoid fever was that made by Thayer and Hewittson in 1893. At that time malaria was

endemic around the suburban portions of Baltimore. Those cases were not founded on conjecture, but the actual parasite was found in the blood. Since then malaria has almost disappeared from Maryland and in every 1,500 to 2,000 cases of supposed malaria the malarial parasite is found in about 5, as determined by the examination of fresh blood or smears. I have no doubt that in the South, as Dr. Harris states, malaria is a very common disease; but I do not think we ought to accept the usual diagnosis by the physician as an actual basis for malarial figures. I think we ought to reject all such cases and base statistics entirely on those cases in which the parasite is demonstrated in the blood either by staining or by an examination of the fresh specimens.

DR. HENRY B. HEMENWAY, Evanston, Ill.: Illinois is exceedingly defective in vital statistics, the state administration having paid very little attention thereto. It is estimated by the Illinois State Board of Health that 80 per cent. of the deaths that occur in Illinois are reported. Of course, that would increase the 400 deaths from malaria quite materially —put it up to 500; but it has been my observation, as Dr. Price has said, that a large majority of the diagnoses that we get as malarial fever would, with the blood test, prove to be typhoid. So far as I know, in Cook county there have not been more than five cases that have shown the peculiar organism of malaria, within perhaps a couple of years. Some were found along the Desplaines River some time ago. Most of the cases that are recorded as malaria—as fatal cases of malaria, particularly—are really typhoid; and that is one reason why the study of malaria can hardly be separated from the study of typhoid, and the study and prevention of yellow fever. I am glad that attention has been called to the necessity of including among the reportable diseases malaria as much as smallpox or scarlet fever.

DR. W. FORREST DUTTON, Walker's Mills, Pa.: Dr. Price brought up a point that I would like to hear explained, not at any length, but satisfactorily enough for those present, namely: mixed infection. I would ask Dr. Harris to give us, if he can, the frequency of typhomalarial infection, the percentage of cases in which it occurs. I do not think there is any reason why we should be at loss to differentiate typhoid from malaria except when there is a mixed infection. I think that by means of microscopic examination of the blood smears we ought to be able to make our diagnosis very readily.

DR. JUAN GUITERAS, Havana, Cuba: I do not think that in the tropics a mistake in diagnosis is frequently made between typhoid and malaria. I understand the mistake may be made with filaria, hookworm and tuberculosis, but not with typhoid fever. The cases reported as malaria in the tropics—in Cuba at least—would seldom be found to be cases of typhoid fever.

Of course, the mistake is possible, but it is exceptional. The unfortunate term of typhomalaria that was invented some time ago was in vogue at that time, because we had no definite means of diagnosing typhoid fever. Malaria in Cuba has fallen from the third and fourth place on the mortuary records to the tenth place. Malaria was originally placed by us on the list of reportable diseases because of the yellow fever campaign. Another important factor in bringing about this reduction of the malarial fevers in Cuba is the isolation of the sick at the port of entry. We are detaining a very large proportion of the patients with malaria who formerly went into the country and, of course, became propagators of the disease. The majority of patients with malarial infection coming from Central America, Mexico, the Mississippi delta, etc., are found with fever on the inspection made by the quarantine officer and are sent to Las Animas Hospital; once there, they are not discharged until they are cured.

DR. J. N. HURTY, Indianapolis: I believe thoroughly in education as the best, perhaps the only way to get these subjects before the people. Sometimes, however, I become discouraged. I went before the county board of health of a certain county in Indiana where malaria was reported as existing to a considerable degree, and from which county several deaths had been reported, and presented the reason of malaria. This county board of health was composed of the county board of commissioners. So I presented the whole matter as carried by mosquitoes and I thought I had made a very excellent impression on the board—that it would take action, print circulars, and perhaps go to draining, and encouraging drainage in the county there and get rid of stagnant water; and I was very confident that I had educated these "practical business men," as they called themselves. One of them turned around and with his hand combed a couple of handfuls of manure out of his beard, saying: "Young fellow, you don't believe all of that stuff, do you?" So sometimes education does not educate, and especially with the man who considers himself highly practical, and—worse yet—with the man who has made a semifinancial success. I think that those men are so consumed with conceit that one cannot get at them. We had a legislator who had cunning enough to amass a hundred thousand dollars. He has decided to be a practical man in his neighborhood; and so practical and so eminent was he in the state that the governor appointed him on a very important examination committee; and when he heard one of our lecturers say that consumption was rarely, if ever, hereditary, he said he did not care if "a thousand doctors and thousand doctor books said that it was not hereditary" he knew that it was. Now, you see, we have a certain class of people (I suppose they exist in other states), who cannot be educated.

DR. SENECA EGBERT, Philadelphia: I remember distinctly that somewhat more than fifteen years ago the secretary of one of the southern states, speaking of the importance of artesian water as replacing that from shallow wells, declared in one of the bulletins that because of the improvement in the well-water supply in certain parts of his state the reduction in malaria had been over 50 per cent. We all know now that the malaria of which he wrote was not malaria, but must have been something else. My experience was that a great many of the people in a locality where I was working used water from very shallow wells; and I remember in one case water that was undoubtedly contaminated, in this village, was taken from wells located a very short distance from a stream, and everybody believed that the wells filled from the stream. On the higher ground above the wells there were twenty-three privy vaults and pig-sties draining directly toward these wells en route to the stream. These people were persistently ill every season, with so-called typhomalarial fever. I doubt very much if any one in the neighborhood had a true case of typhoid fever, but I am convinced that they were suffering from filth infection, and that their general health was depressed by that absorption of human and pig filth. So it seems to me that possibly we may explain much of the reported typhoid fever or malaria if we dubbed it simply filth infection, and occasionally, paratyphoid.

LIEUT.-COL. JEFFERSON R. KEAN, U. S. Army: With reference to the statement of Dr. Guiteras that there were about 40 deaths from malaria in the City of Havana during the past year, I think that the showing is even better than that, my recollection being that it was only 8. Although the difference between 40 and a lower figure is not great for a city of 300,000 inhabitants in the tropics, I wish to call attention to it as an evidence of the thoroughness of the work being done in Cuba. It means the practical extermination of the pathogenic varieties of mosquitoes in and about Havana. The last year that I was in charge of sanitary affairs in Cuba we had to send away from Havana to get anopheles larvæ to show to our inspectors as a part of their course of instruction. I regard Havana at present as not capable of infection with yellow fever and if any one visits the city, unless he stays much longer than most American visitors, he will probably not see a single stegomyia mosquito. In so excellent a paper it seems ungracious to criticize small points, but there is one which I would like to see corrected. I do not want to detract at all from the excellent public work for the extinction of malaria that is being done by the Italians and which we would do well to imitate; and this notwithstanding the fact (as Dr. Price will probably bear me out) that many of the local epidemics which appear in the northern states are initiated by Italian laborers who bring in the infection. While giving the Italians all due credit

for their work I do not like to hear them credited with that of men of other nationalities. Laveran, who discovered the malarial organism, was a French army surgeon, and it was a British army surgeon, Ronald Ross, who first demonstrated the agency of the anopheles mosquito in conveying malaria.

DR. LISTON H. MONTGOMERY, Chicago: I do not think very much of the term typhomalarial fever. Has the Italian government succeeded in reducing the number of deaths by two-thirds?

DR. SEALE HARRIS, Mobile, Ala.: Yes.

DR. MONTGOMERY: It shows that in Italy governmental control is paramount; furthermore, Cuba has succeeded in stamping out yellow fever, and practically malaria also. Cuba has a national department of health; and those two examples would, it seems to me, go to show that our government should have a national department of health, with its physician in the cabinet, as has been done in Cuba. Not only this, but such government commission should have supervision over other contagious diseases, such as tuberculosis and bubonic plague, the latter of which is liable to come from South America, particularly Venezuela, and get into New Orleans almost any day.

DR. J. H. WHITE, New Orleans: The national government is standing guard at this present moment.

DR. MARSHALL LANGTON PRICE, Baltimore: Those of us who have been in New Orleans are familiar with the magnitude of Dr. White's work in the last yellow fever epidemic. I think the problems that he tackled were among the most difficult undertaken in this country; and the brilliant results all of you know.

DR. J. H. WHITE, New Orleans, La.: When I undertook the work of sanitation against yellow fever in 1905 we were confronted with 196 square miles of territory in the City of New Orleans, whereof 44 square miles are built up rather closely; 660 cases of yellow fever; control more or less lost; and nothing but the indomitable pluck of that magnificent people could have enabled success. It was a question of extermination of all mosquitoes in the City of New Orleans or failure. We put 3,000,000 pounds of salt in the gutters in order to make sure that there were no mosquitoes breeding there. Six weeks afterward the water in the bayous through which the gutters reach the lake showed 5 per cent. saline. We cleaned the whole town from end to end; we oiled 68,000 cisterns, and every rain barrel that we could get our hands on; we left nothing to breed on in that 44 square miles of territory; and in the latter end of September, 1905, a new-born baby could have been placed in the streets of New Orleans to sleep. The extinction of yellow fever was not the only result. A result as truly gratifying was that estivoautumnal malaria which

had been common in New Orleans, was distinctly cut down. Having a hospital under my supervision, it is only in the past six months that we have begun again to get estivoautumnal malaria by the river front, by reimportation both of the mosquito and infection from the tropics, proof of this being as follows: At certain points on the river we have lying in close contact steamers from Tampico, Coatzacoalcos, and London and other British ports. These Englishmen occasionally develop estivoautumnalis when they have not been in the tropics for a year or two, and after lying for two weeks in the port alongside the wharf close to the Tampico or Coatzacoalcos ship, and to the collection of water caused by the railroads digging out dirt to fill up their embankments: thus proving the reinfecting of our mosquitoes which have come back only in the last two or three years to that point.

Now, as to governmental control, New Orleans has done her duty very well indeed, in the matter of malarial fever. As I recollect it, the annual death rate in New Orleans back as far as the '70's from fever supposed to be malarial, and probably malarial (because typhoid infection was very uncommon), was close to 335 as the average; and to-day, I think it will not go to 25; and that is municipal work: it has nothing to do with the nation. As a national representative, I say that I think this a pretty good showing in New Orleans, which, if you paralleled with Havana, Dr. Guiteras and Dr. Kean will admit, is a far harder proposition; New Orleans is extended on a mud-flat, below the level of the Mississippi half the year round, the water so sluggish in its flow that it has to be pumped out mechanically, and there is every possible inducement to the mosquito to make its habitat in and around New Orleans. Gradually, slowly but surely, they are eliminating the mosquito. A little more persistence, a little more care, possibly another scare, will be needed to bring them up to it; but I feel sure—as sure as a man can of anything that he has not seen done before him—that New Orleans will, in the next few years, be immune to yellow fever.

DR. SEALE HARRIS: What is the difference in death rate?

DR. J. H. WHITE: As I remember it, the general, as compared with the previous death rate, has been reduced about 2: among the white population, say from 19 to 17; among the negro population, a slight reduction, not so much.

DR. G. FARRAR PATTON, New Orleans: Dr. White, with characteristic modesty, has not mentioned what was really the greatest victory that he won there; that is, overcoming the prejudice of the people. I think it is safe to say that at the outset ninety-nine out of every hundred people in New Orleans believed that the mosquito doctrine was all nonsense, and before the campaign was half over the people of the city, down to the street arabs, were convinced of its absolute truth. That was accomplished mainly by a "hammer and tongs"

campaign of education, attended with positive proof in the way of results. As Dr. White jokingly says, he preached in every church in New Orleans, and it is true: he preached a gospel that saved the lives of the people more effectively, perhaps, than the preachers who ordinarily occupied those pulpits save the souls of their people and I consider that this victory—the moral and intellectual victory—transcended in magnitude the wonderful success achieved in banishing the disease proper before the coming of frost.

DR. R. A. NEALE, Chicago: About thirty years ago I was physician to the poor of Washington, D. C.; I had assigned to my territory a section of the city that was nearly surrounded by water, and it was called "Foggy Bottom;" the three thousand odd people living there for ten or twelve years had been suffering intensely from ague; the little huts that they built were nearly all covered with shrubbery and vines. Foggy Bottom was a piece of land that was marshy; in a number of years it became filled in and houses were built there. My predecessor showed me an average every summer of over 600 cases of typical malaria in that Foggy Bottom. I did not know anything about Italy's great progress in preventing malaria, but I was fearfully annoyed every night by the numerous mosquitoes flying about my head, and I decided that I must get rid of them. I made all of those people get rid of all vines and shrubbery, cut down every tree, and put screens in all the windows and burn sulphur in their rooms. I had them makes hundreds of bonfires at night, hundreds of them; because the breezes would come at night and blow the mosquitoes away down the river; in the morning it would come the other way and blow them back again. The next year of my term, instead of having 600 cases of malaria I had only 50; the third year there were only 25, and nearly all of the patients had recently come to reside in Foggy Bottom.

DR. SEALE HARRIS, Mobile, Ala.: I expected my statistics to be questioned, but those obtained from the United States Census Reports are the only ones available. I am willing to admit that many deaths reported as malaria are due to typhoid fever, tuberculosis, sepsis, hookworm and other diseases, but it is a remarkable fact that along the Mississippi Valley, along the valleys adjacent to the Missouri and Ohio rivers, and in the South, where conditions are favorable to the development of anopheles mosquitoes, there are so many "ignorant" physicians who report these cases of malaria. The United States Army surgeons, I believe, represent as good a class of physicians as we have, and the statistics from the United States Army posts, which are located in all sections of Texas, show that one person out of every seven residing in those posts had malaria in 1901. Not only that, other statistics compiled by Dr. Waldren show that in the railroad hospitals in Texas, which are located in cities in different

parts of the state, where it is certainly probable that there are competent physicians in charge, one patient out of every four has malaria. I admit that my statistics may not be correct, but from my own observations in the South I believe that there a large proportion of the population has malaria at some time during the year. The death rate from malaria is low, and is growing less, and it is a very mild disease, yet it does affect the vitality of the individual; it makes him more susceptible to other diseases, and I believe it materially affects the general mortality rate. I am sure that malaria is growing less prevalent in the cities where there is proper sewerage. I believe that will account for much of the decrease of malaria in Maryland. In Havana and the Canal Zone where the sanitation was worked out largely against mosquitoes the general mortality rate was reduced about 50 per cent., and as Dr. White has pointed out, the general death rate has been reduced in New Orleans since the crusade against mosquitoes.

Regarding the amount of typhomalaria in the South, I do not know of any cases in which typhoid and malaria have been found at the same time in the same individual, but it is certainly true that in the convalescence of typhoid fever malaria does occur. In the tropics during the Spanish-American War, when a large number of United States soldiers had yellow fever, they suffered a great deal more from the malaria that followed. I realize the difficulties of educating the public, but the lessened prevalence of malaria in the South is due to the fact that the educated, "well-to-do" people have their homes screened with the idea of preventing malaria by keeping out mosquitoes, and with such people malaria is less prevalent than formerly. Another reason why malaria is less prevalent in the South is the widespread use of quinin. Dr. H. F. Harris, of Atlanta, studied a large number of cases of continued fever and the greater majority of them responded to the Widal test for typhoid.

I desire to thank Dr. White for calling attention to my mistake as to Laveran being an Italian, but the Italians have done a great deal in studying malaria, and the literature published by the Italian Society for the Study of Malaria is greater in volume than that contributed by any other country.

My object in bringing this paper before this Section is this: While malaria is not perhaps so severe an infection as yellow fever, typhoid fever, tuberculosis and many other diseases, it is one of the more prevalent diseases in the United States. There is a great opportunity for sanitarians in the South to make records by decreasing the death rate from malaria, and in doing that it would be one of the greatest things for our country, particularly for the South, because we have the reputation of being unhealthful. Eliminate malaria and you will certainly decrease the general death rate.

THE RELATIONSHIP OF THE MEDICAL PROFESSION TO PREVENTIVE MEDICINE

H. M. BRACKEN, M.D.
Secretary and Executive Officer, Minnesota State Board of Health
MINNEAPOLIS

To discuss preventive medicine without giving medical men a leading place would be a strange proposition, and yet there is danger of the medical profession losing its leadership in this great work. Should that day ever come it would be one of the greatest misfortunes conceivable. Medical men are able to weigh the pros and cons in dealing with the problems involved in the prevention of disease. A disease may be recognized as transmissible, yet physicians will not know how to prevent its transmission from person to person until its cause is known. After this the method of prevention is easily determined upon.

Dr. J. S. Fulton, in his address as president of the Conference of State and Provincial Boards of Health in 1905, said:

> The people have thrust on us the most tremendous task ever proposed in the history of preventive medicine, the extinction of tuberculosis. They are sure it can be done, because we, they say, have told them so. The conquest is so magnificent that they propose to have a share, and as large a share as possible, for themselves.

But it was not till Koch pointed out the cause of tuberculosis that any intelligent action could be taken looking to the suppression of this disease, and even with this knowledge as to the cause the people can accomplish but little in their movement against this great foe of the human race without the leadership of

the medical profession. The history of smallpox, typhus fever, yellow fever, plague, etc., is a tribute to the medical profession in its relationship to preventive medicine.

Is the medical profession performing its full duty at the present time in dealing with these problems? Without question this Association is the leading medical society in this country. What is it doing for preventive medicine? It has a weakly Section on Hygiene and Sanitary Science. This Section does not come into intimate contact with the profession at large. It represents a mere handful of men which meets once a year in some church basement to discuss topics that are thoroughly familiar to every worker in hygiene, be he medical man, sanitary engineer, sociologist, or layman.

It is not conditions, but the methods of dealing with conditions, that should be studied. This can be done through existing sanitary associations, such as the American Public Health Association, with an unlimited membership; the Conference of State and Provincial Boards of Health, representing those only who are actively engaged in public health work, and the Conference of State Sanitary Executives, which meets from time to time with the Surgeon-General of the Public Health and Marine-Hospital Service.

But these agencies are not enough. We should have a strong section on preventive medicine in this Association; a section that would bring together the leaders in preventive medicine from the profession at large—the laboratory workers, the clinicians, etc. —and from the sanitary workers—engineers, bacteriologists, health officers, etc. Preventive medicine should have a strong representation in this Association during the entire year—something comparable with the work of the Committee on the Pharmacopeia or of the Council on Medical Education. If the Association is not ready to create and maintain such a section, and to carry on such a line of work, then matters pertaining

purely to sanitation might as well be dropped and the present Section on Hygiene and Sanitary Science discontinued.

It is not for this Association to devote a large amount of time to the study of economic problems relating to preventive medicine, but it should state the case and give its members who are interested in such problems an opportunity to work them out. Dr. Fulton, in the address already referred to, states:

> The sociologists have acquired a fund of knowledge concerning tuberculosis, which is quite as scientific and as useful as that possessed by hygienists and medical men. They believe that the methods, which have been developed in the remarkable history of organized charity, may be successfully used in the campaign against tuberculosis. The particular utility of the sociologist in this campaign will be to spread among the people a knowledge of the nature and cause of tuberculosis, and to supply the kind of information not obtainable through the channels which hygienists are accustomed to use. That these lay students can collect useful data, such as physicians rarely obtain, I have been convinced by experience in my own state.

But the responsibilities connected with the control of transmissible diseases can not be turned over to the sociologists. The medical profession must bear a part of the burden. An alliance between the medical profession and the sociologists is most desirable. Assuming that such an alliance will take place, Dr. Fulton says:

> We shall appropriate their information certainly, and their methods as far as they prove adaptable. Meanwhile, our new allies will no doubt learn something from us, and will perhaps think better than we do of our efficiency in this line.

This last is most desirable, for it seems at times that the sociologic leaders are in danger of misbranding the conservatism of the better element of the medical profession, in its dealings with preventive medicine, as narrow-mindedness. It would seem from close observation that the sociologists are in danger, at times at least, of looking to the faddist or the demagogue for

leadership in sanitary matters. That we need the best aid of the conservative sociologist in dealing with preventive medicine is beyond question.

We can not make our appeals against disease sufficiently forceful when they are based purely in humanitarian grounds, but when we talk to people in dollars and cents then the arguments count. This is disgraceful, but it is nevertheless a fact. It is also a disgrace to our country that more is done for our animals than for our people. It is not the animal, however, that appeals to our national legislators; it is only the animal product. The animal has a tangible value; therefore, it is not difficult for Congress, in session, to set aside that great American bugaboo, states' rights, and appropriate hundreds of thousands of dollars to suppress an outbreak of foot-and-mouth disease among the cattle of a single state, while not a cent has thus far been procured through this august body to deal with human tuberculosis. It would certainly seem that if an epidemic disease among animals was an interstate problem a transmissible disease in man would be far more so. A diseased animal rarely travels from state to state unless compelled so to do, but human carriers of transmissible diseases are ever on the move from state to state. If human tuberculosis, smallpox, typhoid fever, diphtheria, and, in fact, every form of human transmissible disease, are not interstate problems, it surely will be difficult to find such problems.

Meat has been made such a prominent interstate topic that millions of dollars are spent annually to carry out federal inspection, and yet the dangers of transmitting disease by this product to a human being is as nothing compared with the dangers through the daily contact of the traveling public, for which not a dollar of national money has been spent.

Dr. Charles Harrington, in his able oration on state medicine,[1] before this Association in 1908, pointed out

1. Harrington, Charles: States' Rights and the National Health. THE JOURNAL A. M. A., June 13, 1908, l, 1953.

that "every attempt thus far made to confer on the national government any real power to supervise the national public health has found the Constitution in the way." Perfected "in an age which knew not steam and electric power and rapid transportation, which knew nothing of the causes of disease and the methods of their spread, which could not foresee the boundless possibilities of the growth and development of the medical sciences, and which could have no conception of the relation of public health to national prosperity," that instrument decreed that "all powers not delegated to the United States or prohibited by the Constitution to the states should be reserved for the states." Further Dr. Harrington states:

From 1700, when Pennsylvania adopted "an act to prevent sick vessels coming into this government," the several colonies had at various intervals adopted their own laws relative to quarantine, and were not in 1796, or later, willing to allow interference with their foreign commerce; for, in addition to their jealous regard for states' rights, there existed then that same spirit of commercialism which seems to outweigh all consideration of individual and collective health. By lax enforcement of quarantine restriction, a port could attract trade that otherwise would have gone to another, where the laws were enforced with strictness, just as within very recent times we have seen local authorities as mindful of the destructive influence of quarantine on trade, that the existence of pestilential diseases has been denied, in the hope that the outbreak would die out before attracting outside attention.

The law of 1796 was repealed in three years in favor of another, which, while providing for assisting the states in enforcing their own laws, empowered the Treasury Department to make rules and regulations concerning the unloading of cargoes of infected vessels at places other than ports of entry, and provided for the storing of cargoes in government storehouses, in accordance with the health laws of any state. This law, it will be noted, related to commerce rather than to public health. Repeated outbreaks of yellow fever led to repeated demands for a national quarantine, but they were always foredoomed to failure on account of the jealous regard for states' rights; and even after the widespread, disastrous

and enormously costly epidemic of yellow fever, of 1878, a most reasonable bill to empower the government to act in emergencies beyond the ability of the states to control failed of passage.

It thus appears that it is a simple matter for the federal government to control commerce by interstate laws. Such being the fact, public health officials, with the aid of the medical profession and the sociologists, should endeavor to bring the welfare of human beings under the head of commerce. A move in this direction was made, I believe—whether intentionally or not I can not say—when it was recently suggested that the existing Public Health Bureau should be transferred from the Treasury Department to the Department of Commerce and Labor.

Dr. Harrington further says:

For a nation that is pre-eminently commercial, this country is singularly blind to the necessity of conserving that which has been well defined as our greatest national asset, namely, the national health. It is useless to attempt to determine the pecuniary loss which the nation suffers annually through sickness and death from preventable diseases, for apart from the mathematical difficulties in the determination of the money value of human life—for human beings are cast in many molds and from different materials, some being parasitic and of a negative economic importance, others of enormous value, and each according to his present and prospective capacities for usefulness—we have but a small proportion of the items necessary for our calculations, which even a moderately good system of sanitary bookkeeping could place at our disposal. The statutory value of five thousand dollars set on a single human life is no more than a guess, and even though it should be determined to be a fairly acccurate one, based on the average of a large number of investigated individual cases, the lack of adequate mortality statistics in a large number of our states would render futile any attempt to express the nation's pecuniary loss during any given period from deaths alone. Equally futile, with absolutely nothing more in the line of morbidity statistics than a mere compilation in a minority of the states of the number of persons stricken with certain of the transmissible diseases, and even then with no data as to

the number of days lost, would be any calculation of the national sickness account. We can say only that with our great and growing population the annual waste from avoidable diseases must be prodigious. It is true that in a number of our states the state and municipal authorities, fully alive to the importance of protecting the public health, spare no efforts to restrict this loss within their respective jurisdictions, though in many but little is attempted, while the nation as a central authority does practically nothing, states' rights or no states' rights, except in so far as it maintains quarantine and the service for saving lives from the perils of shipwreck. It spends not a dollar to check the ravages of the leading causes of death, excepting the amount used in salaries and running expenses of the Bureau of Public Health and the Hygienic Laboratory, which in comparison with the older laboratories of some of the European governments is not yet of great importance, though growing. . . . In 1905, for example, the nation contributed officers' services, but not one cent of the quarter million dollars spent by New Orleans and not one cent of the expenses incurred by Louisiana, Mississippi and Florida to wipe out yellow fever and prevent its spread to other infectible areas, although the insect that carries the infection disregards states' rights, state lines and interstate quarantine.

From the foregoing it must be apparent that there is a great task before those who are interested in public health, and this Association, if it will take hold of the matter wisely, can be of much service. A great wave of public sentiment, in the form of public health legislation, is passing over the country, but without material effect thus far on either nation or many states. Unless something far-reaching is soon accomplished, the pendulum will be apt to swing back and public health problems will then be in a worse condition than at present.

What the future of the American Medical Association is to be in this great work is for you of the Association to determine, and the work can not be begun too soon. As already stated, instead of a weakly Section, which brings together only men who are already working on sanitary problems through the agency of sanitary organizations, we should have in this Associa-

tion a strong Section dealing with preventive medicine from all points of view. We should have a permanent Section with the distinct function of bringing before medical men, through THE JOURNAL of the American Medical Association, all important matters pertaining to the control of disease. Is the Association ready to begin this new organization of its work pertaining to sanitary problems? If so, why not take up the question at once through the proper official channels?

VASECTOMY AS A MEANS OF PREVENTING PROCREATION IN DEFECTIVES

HARRY C. SHARP, M.D.
INDIANAPOLIS

The general public is rapidly coming to realize that our public dependents are largely recruited from the defective classes, and that but comparatively few persons become a public charge as the result of disease or adversity.

Neurologists recognize a so-called predisposition to insanity, which in fact is an inherited defect, or perhaps, more correctly speaking, defects, as there are usually several defective conditions in the mental and nervous organization, and frequently very pronounced physical stigmata.

Sanger Brown says, in speaking of this predisposition, that the phenomena which this condition presents may be readily accounted for by assuming a defect or defects in the neurons (the cell units of which the nervous system is composed) of such a nature that stimuli from environment may not reach the neurons of the cortex, or, having done so, the impression made there may not be sufficiently deep and lasting, or, in other words, well elaborated. Keeping in mind this condition of neuronal defects, it is easy to understand how certain individuals fail to respond to educational influences, moral or intellectual, or both.

That Sanger Brown is correct there is no doubt; and it is equally true that the same condition accounts for the large majority of cases of inebriety, pauperism, crime and drug habit. While defectives fail to respond to

moral or intellectual influences, there is another fact that figures very largely, especially in the criminal class. It is that the centers of self-restraint are most defective. These persons may have full knowledge of the nature of their offences and may fully comprehend that these offences are morally wrong; still they have not the will-power to resist the impulse to commit a wrongful act when the opportunity presents itself. It is possible that such an individual, who would commit a crime under certain conditions, would be the first to reach the mourners' bench at a Methodist revival. He is as a ship at sea without a rudder, wafted about and changing his course with each variation of wind, all being well if the sea is calm and the weather fair; but a disastrous shipwreck is imminent in the event of a storm.

It does not necessarily follow that a defective person is to become a public charge, for included within this class are to be found the most gifted as well as the most vicious, weakest, and ordinarily, the most unhappy of mankind. Chatterton, Goldsmith, Coleridge and Charles Lamb are but a few instances of the class of gifted defectives. Invention, music and art are sometimes of high order among these persons, but desultory, half-finished work is decidedly more common. Concentrated effort is often impossible to such persons. Executive or business faculty and judgment are seldom developed.

Persons of this character who appear on life's stage and play their part contribute much to the world's beauty and pleasure. They fill a place in history, though history often fails to mention the legacy they leave to succeeding generations in the way of defective children, which become a misery to themselves and a charge on society.

There is no disputing the fact that mental as well as physical defects are transmitted to the offspring. If a defective marries a normal person, frequently the departure from the normal is much less marked in the offspring than it was in the parent, while, on the other

hand, if two defective persons marry their children inherit the stigmata of both mother and father, thus becoming a more defective type than either parent.

Naturally the tendency is for the abnormal to mate with their kind—to seeking their own level; then, too, one of this type seldom finds a normal person who would be attracted to him. This condition favors the rapid increase of the number of defectives as well as the accentuation of the type. This class of individuals is very prolific, from the fact that in the matter of sexuality, as in everything else, they know of no self-restraint. They indulge their selfish lust, ad libitum, with no thought whatsoever as to what the result may be; they absolutely refuse to take into consideration their own ability to take care of their offspring. They simply know that they want gratification, and gratification they are going to have.

This is the condition at the present time, and will continue to be so long as this class is permitted to remain fertile.

In addition to the foregoing causes for the rapid increase of defectives, we find that the ranks are being contributed to by persons suffering of some mental, nervous or physical disease or exhaustion, begetting children while suffering from one or more of the above-mentioned conditions. Nature punishes those who violate her laws, and the punishment is visited unto the third and fourth generation. It is very possible that the children of physically exhausted or mentally disturbed parents will manifest a degree of defectiveness.

The children of syphilitics are almost sure to be defectives. Alcoholism, drug habits, immoral excesses are some of the common causes of mental and nervous exhaustion that render a person incapable of begetting normal children. Overwork and many physical maladies which produce in the sufferer a profound mental depression are frequently responsible for defective offspring. Thus it is that we frequently find that the children of

ministers, lawyers, doctors and other professional and highly respected business men have pronouncedly disorganized minds, manifesting the same by immoral, criminal or insane acts.

Prenatal impression plays its part in the production of defectives.

Many of you know or have seen physical deformities as a result of profound mental impression during the period of gestation. As the mental faculties are much more highly organized, they are a great deal more susceptible to such impressions. Hence mental markings are more frequent than physical ones. It is very probable that a child of a woman under a mental strain during this period will show some evidence of nervous disorder early in life, and, if not carefully cared for during the critical periods of development, will be the subject of an outburst that will establish it as an abnormal being, beyond the peradventure of doubt.

Several years since a woman who was the mother of a boy at that time serving a sentence in a penal institution told me that during the time she was carrying the boy a man holding a mortgage on her property, taking advantage of her inability to settle the same at the time of maturity, forced a foreclosure, and it excited in her an intense hatred for this creditor. She could think of nothing save his physical repulsiveness and the unprincipled manner in which he had treated her. He was a homely man with very red hair, and she looked on him as a thief and a scoundrel, having robbed her of her equitable right. When this boy was born he had red hair, notwithstanding there was no such thing known in any of his ancestors, and he had always been apparently criminally inclined, although of a respectable lineage. This was undoubtedly the result of a prenatal impression.

The decidedly defective individual is very easily recognized, as the mental abnormality is usually accompanied with prominent physical defects, described by Lombroso,

Wiesmann and others as morphologic stigmata. There are quite a number of these stigmata which indicate with considerable certainty the extent and nature of the mental defect. I shall not dwell on the various physical abnormalities that are found in the defective. I do wish, however, to call attention to the two that are found most frequently and the least dwelt on by writers on this subject, namely, imperfect refraction and color-blindness. It is very rare that we find a defective who does not have one or the other of the above-named conditions, though possibly to so slight a degree that the defect may be entirely overlooked. There are persons of this class in whom the only indications are temperamental, the most common being selfishness, ingratitude, inconstancy, egotism, inability to resist an impulse or a desire.

The disposition to permit all classes to procreate without restriction has brought about a condition shown by statistics, the study of which will prove very interesting.

Taking Indiana for the past eighteen years we find the following:

In 1890 the cost of maintaining the inmates in the state institutions, county poor asylum and orphans' homes was $1,201,461.24, while in the year of 1908 the cost was $2,443,140.55, or an increase of $1,241,679.31, which is considerably over 100 per cent. This is for maintenance alone, as none of the appropriations for the purchase of additional property, erecting new buildings or permanent improvements are included in this estimate. Nor is the cost of maintenance of county jails or workhouses included, as I was unable to procure accurate data for this period. But I did learn that in the year 1892 there were 600 jail inmates, as against 1,275 for the year of 1908.

In 1890 there were 8,670 inmates confined in state institutions and asylums for the poor; in 1908 there were 14,398, an increase of 5,728. This relates to such state institutions as those for the insane and feeble-minded, reformatory and penal institutions, poor asy-

lums and Soldiers' and Sailors' Orphans' Home. It does not show the total increase, as the Soldiers' and Sailors' Orphans' Home, which is an institution that in no way should be considered as an institution for the care of defectives, shows a material falling off in its population, while the school for feeble-minded youths, whose entire population consists of the most pronounced defective class, shows an increase from 358 in 1890 to a population of 1,054 in 1908, an actual increase of 696, or over 172 per cent. in the course of eighteen years. The asylums for the poor do not show anything like such an increase. But these abodes, like the soldiers' and sailors' orphans' homes, hold many persons who are there as the result of adversity and not degeneracy.

Beginning with the Soldiers' and Sailors' Orphans' Home, whose population is made up almost entirely of normal persons and which shows a decrease in population, on up through the county poor asylums, county orphans' homes, prisons, insane hospitals, epileptic village, and institutions for the feeble-minded, each institution shows an increasing percentage in proportion to the extent that it depends on defectives for its population.

In view of the above-described conditions, it seems to me it is race degeneration and not race suicide that should fill us with apprehension. History teaches that the fall of powers and principalities in the past has been due to the weakness of the people and not to the scarcity in numbers. Shall we follow the example of past ages or shall we learn from them a lesson and profit thereby?

Herbert Spencer says that to be a good animal is the first requisite to success in life, and to be a nation of good animals is the first condition to national prosperity. We may become a nation of good animals if we direct the same intelligence to the breeding of human beings that we do to the improvement of the breed of our domestic animals.

Restricting propagation seems to be universally agreed on as necessary for the relief of the downward tendency.

The difficulty lies in deciding on the proper method to bring about this restriction. Some have advocated the education of public opinion so that those who are from defective parentage shall, in the face of such public opinion, abstain from marriage. This seems to me even worse than absurd, for I believe that we shall never be able thus to prevent the sexual intercourse; while there might be fewer marriages there would be more bastards.

Restrictive legislation has been advocated and many states have passed restrictive marriage laws. Minnesota has a law providing that within the bounds of the state no marriage shall be permitted either party to which is epileptic, imbecile, feeble-minded or afflicted with insanity, unless the woman be over 45.

Michigan, Delaware, Connecticut, Indiana, New Jersey and North Dakota have also passed laws for the purpose of preventing marriage among defectives, but unfortunately matrimony is not necessary to propagation, and the tendency of these several laws is to restrict procreation only among the more moral and intelligent class, while the most undesirable class goes on reproducing its kind, the only difference being that illegitimacy is added to degeneracy, and thus the children enter on life's battle doubly handicapped.

Dr. R. W. Bruce Smith of Toronto asks:

> What avails the continuous increase of hospitals, asylums, and similar institutions if the number to occupy them grows faster than the accommodations? How can we possibly leave the world better for our work if we do not, at least, begin some action to stop this vicious stream at its fountain-head? . . . Those who have faithfully and patiently wrestled with this perplexing problem have concluded that the only course to be taken is to separate all true degenerates from society and keep them by themselves in carefully classified groups, under circumstances which will insure that they shall do as little harm to themselves and their fellows as possible, and that they shall not entail on the next generation the burden which the present one has borne.

This method of segregation would necessitate the expenditure of enormous sums of money to establish and

maintain colonies or industrial refuges which, I believe, would be a disappointment in the end. The colonists would necessarily live under restraint and, unless guarded like actual prisoners, many would escape. In their effort to escape detection these unfortunates would naturally realize that they could not engage in legitimate trade, and therefore would resort to crime, becoming a further menace to society. This plan, moreover, means life imprisonment for a large army of men and women who should be given the opportunity to enjoy life and liberty.

Castration is another means that has been suggested for the purpose of preventing procreation in the unfit. A superintendent of a Kansas institution for the feeble-minded thus operated on forty-eight boys in that institution about the year 1898. He has since severed his connection with the institution and if there has been any further report of his work I know nothing of it. This operation is, as I have repeatedly stated, of too much gravity and causes entirely too much mental and nervous disturbance ever to become popular or justifiable as a medical measure; but I heartily endorse it as an additional punishment in certain offenses.

It can readily be seen that one subjected to castration would in all probability become very morose and downcast on account of the deformity alone. Besides, the testicle has a double function, that of providing an internal as well as an external secretion, and the organism cannot maintain a normal condition when robbed of this internal secretion. This is manifested by the perceptible change in the eunuch.

Since October, 1899, I have been performing an operation known as vasectomy, which consists of ligating and resecting a small portion of the vas deferens. This operation is very simple and easy to perform. I do it without administering an anesthetic either general or local. It requires about three minutes' time to perform the

operation and the subject returns to his work immediately, suffering no inconvenience, and is in no way hampered in his pursuit of life, liberty and happiness, but is effectively sterilized. I have been doing this operation for over nine years. I have 456 cases that have afforded splendid opportunity for postoperative observation and I have never seen any unfavorable symptoms. There is no atrophy of the testicle, no cystic degeneration, no disturbed mental or nervous condition following, but, on the contrary, the patient becomes of a more sunny disposition, brighter of intellect, ceases excessive masturbation, and advises his fellows to submit to the operation for their own good. And this is the point in which this method of preventing procreation is so infinitely superior to all others proposed—that it is endorsed by the persons subjected to it. All the other methods proposed place restrictions and, therefore, punishment on the subject; this method absolutely does not. There is no expense to the state, no sorrow or shame to the friends of the individual, as there is bound to be in the carrying out of the segregation idea.

There is a law providing for the sterilization of defectives in effect in Indiana and it is being carried out at the Indiana reformatory. I regret very much that it is not being followed up in the other institutions of the state; but there is no doubt that it will come about in a very short time.

Brown-Séquard, one of the earliest observers of the effect of the secretions of the reproductive glands, said that an extract from the fresh testis, when injected under the skin or into the blood current, had a remarkable influence on the nervous system, mental and physical vigor; that the activity of the spinal centers were greatly improved, not only in cases of general prostration and neurasthenia, but also in the case of the aged. Brown-Séquard maintained that the general dynamogenic effect was due to some unknown substance formed in the testicle and subsequently passed into the blood.

Although many of the more recent investigators as Poehl, Zath and others assert that it is found in the external secretion, my own observations lead me to indorse the opinion of the latter.

After observing nearly 500 males in whom I had severed the vas deferens I am prepared to state that there is not only a diminution of the muscular and nervous fatigue resulting from muscular exertion, but also a lessening of fatigue sensation and a decided increase of energy and well being. I have observed splendid results in cases of neurasthenia.

That severing the vas deferens or the oviduct does not arrest the sexual development has been proved by doing the operation on young animals before they reached the period of puberty. That there is no atrophy or cystic degeneration has been satisfactorily demonstrated by ten years' observation. It was on account of these facts that I suggested that the vas deferens in the male and the oviduct in the female be severed as a means of preventing procreation in defectives, as the operation has no deleterious effect on the subject, but the contrary. The operation in no way endangers life.

After cleansing the scrotum with soap and water I bathe the part in alcohol, then grasp the spermatic cord between the thumb and the index-finger of the left hand, detect the vas, hold it firmly and fix it with a pair of bullet forceps, then cut down on it, draw it through the scrotal wound by means of a Tenaculum hook, strip it of all membranes and the accompanying artery, ligate above and sever, cutting away any portion from the vas that may have been damaged in the manipulation. This is done in order that the end next to the testicle may not become closed. It is very important that it shall remain open, in order that the secretion of the testicle may be emptied around the vessels of the pampiniform plexus and there absorbed, for it is through this process that the economy receives the tonic effect of the secretion; also

where the end closes there is likely to be cystic degeneration. The action of the muscle closes the skin wound and no stitch, collodion or adhesive plaster is needed. The patient returns to his work immediately and suffers but little inconvenience.

There is no diminution of the sexual power or pleasure. The discharge at orgasm is but slightly decreased.

The operation in the female is more difficult, but, if skilfully done, no more hazardous. The oviduct is reached through a median incision, the tube ligated near the uterus and severed beyond the ligature.

There are over 300 girls in the institution for the feeble-minded in Indiana who, if treated in this manner, would be able to leave the institution and be self-supporting, as the only reason for detention is for the purpose of segregation, as they have not the character to resist the importunities of unprincipled men when thrown on their own resources. The result is that when they are released from the institution they shortly return in a state of pregnancy, or marry some one unable and unfit to rear a family. In either event there is an addition to the dependent class. With the oviduct severed this danger is absolutely obviated. In case of the male the desire for the opposite sex is in no way diminished; his mind is strengthened and his nervous system benefited from the reabsorption of sperm. It has a decided effect on the centers of self-restraint, besides improving the physical condition, as the masturbator refrains from excessive indulgence in this practice. Almost wholly as the result of increased will-power, the rapist or criminal will be aided in resisting his pernicious impulses. Thus we have a means of preventing procreation in the unfit, at the same time improving the condition of the unfortunate individual.

316 Board of Trade Building.

ABSTRACT OF DISCUSSION

DR. L. H. MONTGOMERY, Chicago: If the stigmata of a defective or degenerate are transmitted to the children in many instances, as I firmly believe, how are we going to be entirely satisfied, scientifically and otherwise, that tuberculosis is never transmitted to the offspring? We are all aware that syphilis, insanity, epilepsy and other neurotic conditions are handed down and—due to prenatal influences or otherwise—even alcoholism is inherited or transmitted sometimes. We all see instances of these influences transmitted to the offspring. How are we going to do away, entirely, with this question the author has just raised?

DR. F. C. VALENTINE, New York: Every specialist in genitourinary diseases must agree with the important physiologic and surgical points brought forth by Dr. Sharp. For emphasis it may be permitted to elaborate them by separate discussion. He says that vasectomy is easy to perform; to this one may add that it is the simplest operation in genitourinary surgery. It is well known that the health of the testicle is not impaired by severing its excretory duct, as the testicle does not suffer from occlusion of the duct, as occurs in epididymitis. Moreover, within the last few years many vasectomies have been performed, at White's suggestion, in the hope of thereby relieving prostatic hypertrophy; the testicle, so far as literature shows, was in no wise affected thereby. Two objections to the operation at once occur to the mind, namely: Most, if not all, those operated on were prisoners, therefore the power to procreate was taken from them under duress; it remains questionable that we have a legal right thus to deprive them. On the other hand, the public will soon learn that vasectomy does not influence the power to perform sexual intercourse, but does away with the risk of impregnation. This would lead many sexual profligates to importune physicians for this preventive operation, which involves practically no pain, and, if carefully done, is without danger. To say that no practitioners would be found thus to subvert the purpose of marriage, would be expressing a faith in the morality of the profession even greater than that which I possess. In mitigation thereof, it is but proper to admit that should the person operated on desire the restoration of his procreative function, the continuity of the severed vas and its patency can be restored by a second operation. The restoration of the vas is by far a more delicate and difficult operation; neverthless, when properly performed, it has proved successful. That vasectomy can impart stamina, moral strength, the ability to resist immoral impulses and temptation, as suggested by the author, is, I must confess, an entirely new idea. While no explanation presents itself for this peculiar psychologic victory, the author merits inexpressible credit for the results he has obtained. His essay will doubtless lead many other surgeons of reformatory and

penal institutions to test the question. If the reduction of criminals results his name will go down in history as a notable pathfinder.

DR. W. FORREST DUTTON, Walker's Mills, Pa.: It is not clear to me what is meant by the defective classes and their limitation. We know that with the increase of population the defectives are bound to increase. We cannot yet deny the part played by hereditary influence. I think we have discovered the efficacy of educational factors in many cases, and that instruction should bear a great deal on these things. If we get at the root of all this evil, we will have no trouble at all in preventing the defective classes. In the adoption of so many radical remedies for wrong conditions in the past, I think the educational feature is the factor that should be paramount in dealing with defective classes, whatever they may be.

DR. WOODS HUTCHINSON, New York: Crime is a medical problem in at least half of its extent; and I look forward to the day when the physician will be looked on as the criminologist of the country, and when our police courts and our police administration will be put largely under medical control; and when that time comes we shall save half of the cost of our courts, our prisons, and our poorhouses. We have the humiliating spectacle of the defective criminal insane of the community, 2 per cent., putting to enormous expense and holding in terror the other 98 per cent. of the community, because we have never taken any steps to stop this at its fountain head by preventing this reproduction of defectives. Those questions of the increase of crime are very difficult of settlement; because, in the first place, we are enlarging our definition of crime constantly, making many offences which were not considered offences before; as, for instance, in the prohibition communities it is a crime to buy a drink, and in our new tuberculosis campaign we have taken away our former right to spit. Therefore, it is not safe to judge by the apparent increase in the number of convictions. On the other hand, it seems almost certain that these people are at least holding their own with the rest of the community. They have an enormous fecundity. I had the opportunity, recently, of seeing the family records of defective children who had been committed to the New Jersey home at Vineland. Over three hundred records had been taken for the purposes of correctional care. Most individuals had from one to three, and in some cases six or seven, defective relatives; and the families were large, running anywhere from six to twelve and fourteen. The birth-rate is high among such people; on the other hand, they have a very high death-rate, so that helps to keep matters level. About one-third of all our criminals are born of criminal ancestors, and that reproduction might have been prevented if we had taken the matter in hand. Dr. Sharp has made a

valuable practical contribution to this question, particularly the fact that it is an operation which is so painless and produces so few undesirable results that defectives are willing to submit to it of their own accord. That, I think, at first appears almost too good to be true; yet those people are not at all desirous of having children; it is not only the feeble-minded who would be glad to be relieved of that responsibility. One of the objections made to this operation is that it might become popular in other classes of the community. By putting these people in this condition we can allow them to return to outdoor life and to a self-supporting existence. Physicians having anything to do with defectives are aware that the most serious practical problem in the care of the female defective is this question of preventing reproduction. These women have to be kept under custodial care during child-bearing life. A feeble-minded man has to find a feeble-minded woman before he can procreate; a feeble-minded woman has no such limitation. A movement of this sort would immensely increase the production of defectives in the community. Whether it is going to be productive of all the moral and hygienic benefits to the defectives themselves that Dr. Sharp claims for it I do not know. It is only fair that the male gland should be subject to the same assaults as the female gland has for twenty years past, and see what the results are. I can easily believe that the criminal and the defective would be rendered more amenable to discipline by this operation, inasmuch as it has been habitually practiced on horses and other animals for the purpose of making them more amenable to control.

DR. CHARLES A. ROSENWASSER, Newark, N. J.: As vice-president of the Dependency and Crime Commission of New Jersey, I took part in an investigation as to the causes of dependency and criminality, and had occasion to note the important part played by heredity in the development of the defective and delinquent. That there is urgent need of doing something practical and effective to lessen the propagation of the unfit, has been strikingly shown by the investigation conducted some years ago in Illinois, as a result of which it was learned that all the defectives and delinquents in the state at that time, could be traced to one hundred and fifty families. I intend to have introduced into the legislature of New Jersey, this winter, a bill similar to the one introduced in Illinois this year, making the sterilization of habitual criminals compulsory. And, at some later time will take up the defective class. As my work lies largely with inebriates, a class of patients with weakened will power, I am especially interested in the statement that the operation of vasectomy helps to restore the will power, and I hope to be able to test its efficacy in the near future. As to the value of education in lessening the propagation of defectives and delinquents, I am not very hopeful. That education is of very scant value in such mat-

ters is seen in the attitude of the medical profession toward the alcohol problem. Physicians as a class are well informed as to the baneful effects of alcohol on the individual and on society, yet among them we find very few total abstainers. If enlightened persons cannot be brought to total abstinence by education, how can we expect to educate a defective or delinquent to abstain from sexual intercourse or from propagation?

DR. J. N. HURTY, Indianapolis: I have watched the progress of this work with a great deal of interest. I do not think that we have any figures as yet showing that much in a direct way has been accomplished; but I believe that this may be termed a higher hygiene, through which we can hope to better the race. It is futile to educate these people with criminal stigmata. You can't do it. Education does not reach them at all. They have little moral sense, little moral force, and while you can tell them, and they can in turn preach to you the morals of the situation, they will go straight off and commit the acts. They have no will power, no force of mind, to withstand temptation. So education will not reach them. The knife only can reach them. I was at Mr. Vanderbilt's estate at Asheville. He raises all manner of animals there—cats, hogs and dogs—of many varieties. I was standing near the man who was in charge of the beautiful collies at the kennels; one of them (a female) came up to me, and she looked so pleasant that she seemed to me to have a laugh on her face. I patted her on the head, and she was duly grateful for the attention. I asked him, "Do you have any vicious dogs here?" He said: "Do you suppose that we would breed from vicious animals? If a vicious animal appears here we kill it; we have nothing to do with them at all; and the result is that we have no biting animals, but only those amenable to instruction." Why cannot we apply this to the human family? It seems to me that the application is possible; and I would not term it inhuman. It could not interfere with man's rights. A person who is morally defective has no right to impose another defective on the human family. We take from them their lives when they are murderers—hang them, electrocute them—and it is not nearly so severe to take from them their right to procreate. It has already been shown that there are many of this class who prefer not to procreate and voluntarily submit to sterilization.

DR. W. FORREST DUTTON, Walker's Mills, Pa.: I should like to have Dr. Hurty define the limits of this class. That is to say, What is meant by defectives in the broader sense of the word?

DR. J. N. HURTY, Indianapolis: That would be difficult, indeed. At the present time I would confine vasectomy, if we adopt that method, to those convicted in the courts. We could not extend it further at present; but science may advance some time in the future so that all could be reached.

The law in Indiana says that the man shall be examined; if he is found unfit, and has the stigmata of degeneracy, then he is sterilized. The method is not prescribed; any method may be used. That is about as far as we can go at the present time.

DR. HARRY C. SHARP, Indianapolis: In tuberculosis, of course, we are not dealing with a defect. There are families that have low vitality; and it seeems to me to be transmitted from one generation to the other. As to the danger of vasectomy becoming popular with a certain class, I fully comprehend that; and I think we should have on the statute books of every state (and we in Indiana realize this since the matter has become so generally understood) a law attaching criminal indictment to any one submitting to this operation or performing the same without due process of law which would be binding. The statement that no one voluntarily gives up the power of procreating, is, in the face of facts, entirely wrong. Many women in this country, and a great many more in Europe, particularly in France, have submitted to major surgical operations in order to avoid procreation. We are all human beings, and we are all submitted to temptation. The one who is normal withstands the temptation; and the one with weaker powers of resistance succumbs. The present law in the state of Indiana, and the only one I think justifiable now, is the one dealing with people in the public institutions. They may have committed crime; they may be in our poor asylum, orphans' homes, insane asylums, or institutions for the feeble-minded. I stated in dictation of my paper (its omission was an oversight of my stenographer) that while the apparent increase in France is not borne out by facts, the definition of crime has been materially extended in several fields; law has been more vigorously enforced. Furthermore, regarding insane asylums, heretofore people have kept their afflicted relatives at home, now they put them in public institutions. All those things contribute to show an increase in criminals and defectives; nevertheless, the actual increase is out of proportion to the increase of population.

I began this work in October, 1899, and from 1899 to 1907 this operation was done on 176 men in the Indiana Reformatory on request. The request was solely for the purpose of relief from the habit of masturbation, and I will give as an illustration the story of my first operation, in October, 1899. A boy 19 years old came to me and asked that he be castrated, as he could not resist the desire to masturbate. I first had him put in a cell with a fellow inmate, thinking that perhaps he would be abashed and the sense of shame would prevent him. He came to me again, still insisting on castration, saying it was just as bad as ever. I did the operation, and two weeks afterward he came to me and said I was just fooling him, that I had not operated on him and he wanted the other operation. I asked him to wait two months and

then, if he was no better, I would perform castration. In two months' time he came to me and told me he had ceased to masturbate and that he was all right. I asked him if he had lost any desire or pleasures of the gratification. He said: "No, but I have the will power to restrain myself." That institution conducted a school of letters. This patient was unable to make any progress in the school. Three months after that operation he made satisfactory advance in the school. This was true, practically, of every man operated on; every man who has ceased to masturbate has assigned the same reason: practically every man has told me he sleeps better, feels better and has a better appetite. In that institution the men are sent out on parole. We have satisfactory and unsatisfactory paroles. That is, those men who violate their parole and are brought back to the institution, "jump their parole" (as it is termed), which means that they leave their place of employment and run off. About 65 per cent of the average of that population are satisfactory paroles; that is, of the number of men who are paroled, 65 in 100 receive their final discharge as "satisfactory"; 35 are either returned or leave their place of employment. My last report indicated 203 of the paroles in these men who had been operated on in the last ten years, and 5 of that 203 were unsatisfactory. Since this law was enacted, of course, we have been doing the operation by means of a commissioner appointed. The man's ancestry is inquired into. If the man has had syphilis he is not considered a fit subject to procreate, and he is sterilized. Any man in a criminal institution, when told that he is to be operated on, resents it; so that all these men we have operated on resent it at the time; but subsequently they approve. I have operated on three physicians, and they have all assured me that they have a decided lessening of muscular and nervous fatigue.

THE NOTIFICATION TO THE HEALTH AUTHORITIES OF CASES OF ABORTION AND MISCARRIAGE

MYER SOLIS COHEN, A.B., M.D.
PHILADELPHIA

Physicians are not permitted to disclose any information that they have acquired in attending a patient in their professional capacity and which was necessary to enable them to act in that capacity. Professional secrets belong to the patient and can not be disclosed without the patient's consent. It is but right and proper that information acquired for a specific and humane purpose should be put only to the use for which it was obtained. Many sick and injured persons otherwise would deceive their physician or forego medical attention altogether, especially if guilty of crime.

Exceptions to this rule, however, do exist. Whenever the interests of the people as a whole are paramount, the individual rights of the patient are set aside. In many states, for instance, physicians are required to report to the health authorities all cases of tuberculosis. In others before a marriage license is issued the absence of venereal disease must be certified to. All births must be reported, even when illegitimate, the name and address of the unfortunate mother being given in such cases, and that of the father also, when known. The question, therefore, is not whether the professional secret is inviolable, but under what circumstances it should be disclosed.

So far as I have been able to learn, nowhere is abortion or miscarriage a notifiable condition. Cases

that end fatally come to the knowledge of the authorities through the death certificate, which under some laws must mention the fact when death is due directly or indirectly to this cause. A district attorney, however, speaking at a medical meeting, held that self-induced abortion should not be reported, whether the patient lived or died. In cases of criminal abortion some believe that a physician is not permitted to disclose any information he may possess, even on the witness-stand, whether the patient be living or dead. On the other hand, in some states a physician is compellable by law to testify in the witness-box—not voluntarily—what he knows indicating the commission of criminal abortion when the victim of that abortion is dead; but must keep silent when the patient survives and does not waive her privilege. In the latter instance some think that the physician should endeavor to procure the consent of the patient to inform the authorities, even though she survives. Others say that the law forbids only the disclosing of such information as is necessary to enable a physician to treat his patient, which does not include evidence of wrongdoing. It has been maintained, moreover, that a physician summoned to a case of criminal abortion has a duty to fulfil to the community, as well as to his patient. I would add that he also has a duty to himself.

Every physician who attends a case of abortion or miscarriage, whether accidental, self-inflicted, or brought on by another, lays himself open to the charge of having committed a criminal operation, especially if he had been in attendance on the patient previously. Should the woman die, suspicion points to him still more strongly and if a coroner's autopsy shows that a crime has been committed, he is placed in a decidedly awkward position. An innocent physician could easily be made the subject of blackmail.

It has been suggested that in all cases of suspected criminal abortion the general practitioner safeguard

himself by calling in as early as possible another independent medical witness. But it is difficult to see how this would remove the suspicion. The consultant would have no personal knowledge as to how the abortion occurred. In fact, an abortionist could then avoid suspicion by merely calling in another physician, who even might be a fellow-criminal. And surely it is no less a breach of professional confidence to make known a patient's condition to a physician who is called in, not to assist in the treatment, but merely to protect the attendant, than to report the case to the health officer, the one who is responsible for the health and the vital statistics of the community.

Compulsory notification might act as a deterrent to the abortionist, as suspicion would naturally fall on those who fail to report their cases or who report a great many.

Undoubtedly vital statistics lack important data when they fail to include the number of abortions, miscarriages, and still-births. Such information is necessary to the study of the problems of fecundity, depopulation and race suicide, matters of the greatest importance to the nation.

Census reports would be more valuable, physicians would be protected, and crime discouraged if the occurrence of abortion or miscarriage were made reportable by law. On the other hand, no breach of professional confidence will occur if the name and address of the patient be not given, the location merely being indicated in a general way. Nevertheless I see no reason why the same procedure should not be followed that obtains when a birth occurs, namely, the reporting of the patient's name and address. This naturally should be regarded as a privileged communication, to be kept secret by the health officer or registrar, unless a good and sufficient reason exists for disclosing it.

Should the report contain more than the mere statement of the occurrence of the abortion? It might be

advisable for the physician to give his opinion as to the cause, whether accidental or criminal, and in the latter instance whether self-induced or brought on by another. My own opinion is that no details should be given and no suspicions mentioned, unless the patient dies, in which event the attendant should be compelled to communicate all the information in his possession.

Who is the proper official to be notified? The coroner is suggested by most writers. That he should be informed when death ensues goes without saying. But there is a question in my mind whether he should be made acquainted with any cases except those ending fatally. I fail to see why convalescent and uncomplicated, accidental cases should be reported to the coroner, whose duty is to investigate the cause of death. Mere detection of crime properly belongs to the prosecuting attorney of the county. It would appear more fitting to report to this officer when a crime has been committed. But it hardly seems right to notify him in the absence of crime.

In my opinion, physicians should be required to report cases of abortion and miscarriage to the same official to whom they report all other notifiable conditions, namely, the health authorities. The health officer, who usually records the deaths and births and the existence of contagious disease in a community, should also be notified of the premature births, the still-births, the miscarriages and the abortions. He can then inform the coroner or the prosecuting attorney when in his judgment this seems indicated. In those states, however, where births and deaths are reported to a state or district registrar, it might be well to report to him all abortions and miscarriages.

It would, therefore, be well for the Committee on Legislation of this Association to urge the enactment of a law requiring the physician or midwife attending a case of abortion or miscarriage or still-birth to report such case to the proper health au-

thorities or to the registrar, and if there be no attending physician or midwife, requiring the patient or her husband, or the householder or owner of the premises, or the manager or superintendent of a public or private institution in which the abortion or miscarriage occurred, to give such notice. This is the procedure followed in Pennsylvania in regard to infants born alive. Why should it not be applied to every product of conception that passes through the birth canal?

4102 Gerald Avenue.

ABSTRACT OF DISCUSSION

DR. W. FORREST DUTTON, Walker's Mills, Pa.: I regret to say that the bureau of vital statistics, as conducted by the state of Pennsylvania, is one of the greatest farces ever palmed off on an intelligent people. The physician is required, by law, to report all stillborn and other children; yet a midwife (of which there are very few in Pennsylvania licensed) or any other party can report these cases. Within the last few years hundreds of these cases have come to my notice which were never reported; and after the matter was reported to the state authorities they would write a few letters to these parties, and if these were not answered the prosecution was not carried any further. I think it would be a very good thing to have these cases reported; but unless we can get the laws changed and make them more forcible and see that they are carried out, I think it is only farcical and futile to try to attempt to secure any benefit by the registration of vital statistics, especially in Pennsylvania.

DR. MARSHALL LANGTON PRICE, Baltimore: I should like to correct Dr. Dutton's misapprehension of the state of affairs in Pennsylvania. The registration area of the United States depends on the registration of births. Most of the state registrars have found it difficult enough to secure them in sufficient extent to meet the requirements of the census. There is not one of the seventeen or eighteeen registration states that now registers births, with the possible exception of Massachusetts, and if Dr. Dutton were acquainted with the difficulties in the registration of births I think he would not be so severe in his criticisms of the Pennsylvania state authorities.

DR. W. FORREST DUTTON, Walker's Mills, Pa.: I may be a little warped, but, nevertheless, it is an exasperating fact that the state authorities arrest physician after physician who possibly has been so busy that he did not have time to register a case, and fine him from $75 to $100 for each case. It would

be a different thing if the authorities were not informed that midwives and others do not report the births of children and were not told exactly where these people are located, yet they do not prosecute them.

DR. MARSHALL LANGTON PRICE, Baltimore: What is the specific case to which you refer?

DR. W. FORREST DUTTON: The non-reporting of births and of stillborn children.

DR. MARSHALL LANGTON PRICE, Baltimore: So far as I know, only one prosecution has been brought in the United States for the failure to register births, and that was in the state of Minnesota. I mean one successful prosecution. We have frequently all the evidence complete, and present it to the courts, and the courts fail to convict. Now, so far as I am individually concerned as State Registrar of Maryland, I intend to prosecute in the near future for failure to record births. I cannot promise now, or at any future time, that any of these prosecutions will be sucessful.

DR. W. FORREST DUTTON: Within a few months several physicians about Harrisburg have been prosecuted; but it seems an injustice to the physicians to prosecute them and not to prosecute the midwives. Especially people who take care of their own children should be reported.

DR. J. N. HURTY, Indianapolis: Did I understand there is no place in the United States where accurate statistics of birth are collected?

DR. MARSHALL LANGTON PRICE: There is no registration area in the United States for the reporting of births except Massachusetts.

DR. J. N. HURTY, Indianapolis: This is the second year we have collected birth statistics in Indiana. We believe we now secure records of within 2 per cent. of the births. This belief is based on a newspaper test. This test consists in taking all the newspapers published in the state, reading them, recording the births noticed therein and then seeing if the certificates have been received. All birth certificates come to the central office and we have found by this test that we receive 1.9 per cent. The doctors of Indiana are aiding the work splendidly. The Indiana State Medical Society passed a resolution strongly favoring the collection of birth records, and pledging its members to do all they could to make the work accurate. All but two or three county medical societies passed similar resolutions. In this way the profession is behind the work. Our trouble lies principally with the licensed midwives, and several of this class have been fined and their licenses taken away, because of failure to report births. There have been two or three successful prosecutions against physicians who have failed in their duty.

DR. MARSHALL LANGTON PRICE: I am glad to hear; because successful prosecution is absolutely essential to the recording of births.

DR. J. N. HURTY, Indianapolis: While I am on the floor I wish to endorse everything that Dr. Cohen has said in his paper. It is an excellent paper. We should report to the coroner every suspicious death. The law requires this in Indiana.

DR. SENECA EGBERT, Philadelphia: I can, perhaps, explain to Dr. Dutton the reason for the rigidity of the Pennsylvania health authorities at present. If I am not mistaken, a few weeks ago a number (I think about six) of Philadelphia's physicians were reprimanded for failure to report births. This brought in a very large number of birth reports that had not previously been sent in. My recollection is, further, that none of those who were remanded were pushed to the extreme of the law's penalty. They simply were cautioned, and the result of the campaign was achieved, because the delinquent reports came in.

DR. W. M. BRUMBY, Austin, Texas: Our Texas state registrar has not been able to persuade our state and county authorities to follow the census bureau on the blank certificates of births and deaths and the reports, are by no means complete or accurate. I do not think, however, that we have had much trouble in some of our more essential features of vital statistims. I doubt very much the possibility of being able to get our people, or anybody else, to report on miscarriages, as recommended by Dr. Cohen. In a state where we have such a large percentage of ignorant people ushered into the world without any assistance, and out of it in the same way—no one officiating at either ocurrence unless some old woman that we never heard of before—it is difficult to get reliable statistics. Our midwives do not take up that occupation until they reach the age of uselesseness for all other purposes.

DR. W. H. DONALDSON, Fairfield, Conn.: I cannot allow to go unchallenged the statement regarding registration. Connecticut does not take a second place with Massachusetts, or any other state in the Union, in the matter of vital statistics. Registration of birth certificates, as well as death certificates and mariages, is as complete in Connecticut as in any state in the Union. I believe that we have a very high percentage. Of course, we do not get in every birth certificate; but we have an excellent health officers' law that has been in force for fifteen years, and I believe that there is a very complete registration of births, marriages and deaths. I do not propose to have Massachusetts placed ahead of us. Connecticut was one of the first to adopt registration and now stands well at the head. I could not get the idea of Dr. Cohen's reason for reporting all the cases that he suggests. As a health officer, I take opposite views with him. I do not believe it is possible, until we get

nearer the millennium, to get all these cases. We are fighting for the reporting of tuberculosis and the contagious diseases. Now it is suggested that we have malarial diseases, abortions and all sorts of cases reported. We might as well stop specifying and say that all cases that come to our hands shall be reported to the health officers and the coroner. I do not believe that it is possible to secure the enactment of any such law, and the reporting of any such cases, and I doubt very much the benefit to be derived from it.

DR. MARSHALL LANGTON PRICE, Baltimore: It seems to me that the Germans have come nearer to recording birth certificates than any other nation in the world. There is a stub attached to the birth certificate which must by law be returned by the parent. The original certificate must be returned either by the midwife or the physician. If the parent's certificate is received and not the physicians, the authorities generally want to know the reason why, and a fine is very apt to be imposed on the offender. On the other hand, if the physician's certificate is received and not the parent's, the authorities likewise make inquiries, with practically the same result. If we could get out laws up to the German standard and use the double certificate it seems to me that the real solution of the problem would be reached.

DR. HENRY B. HEMENWAY, Evanston, Ill.: I was called many years ago to attend a young lady whom I had always regarded as a model of propriety. She was active in church work, etc.; there was absolutely nothing about her life, as I knew it, to lead to suspicion. The symptoms given were those, more particularly, that might point to typhoid. She stated that she had had her usual menstrual period one week before. She had a temperature of over 102 F.; there was a general abdominal tenderness, and slight tympanitis. In many ways the general symptoms were those of typhoid. I said that the case looked to me suspicious of typhoid. Later, by the merest accident, a note was left where I happened to see it—a note to a legal friend, and from a young man whom I had not the slightest reason to suspect knew this young lady; and the note read something like this: "Dr. Hemenway says my girl is threatened with typhoid. If the truth comes out, what shall I do?" I could read between the lines, and running through all the cases that I had seen I picked out this one case, and the next time I went there I sent the mother out of the room to get something and said to the girl: "You have had an abortion performed." The answer was: "Don't tell mother." Now, that case very likely would have got beyond control before I discovered what the facts were, if it had not been for that note. There was nothing at all in the history as I could get it, or in the examination as I made it, which would point to the actual facts, and if the girl had died under any such circumstances

(she might have died very rapidly), it is more than possible that things might have looked very peculiar for me.

DR. MYER SOLIS COHEN, Philadelphia: Some one asked, what is the use of reporting cases of abortion? Three things would be accomplished. The first is the perfection of vital statistics. I saw the statement in a government report that in certain sections of the country the birth-rate is diminishing. In France the question of race suicide is most important. There can be no reliable information on the subject when cases of abortion are not reported. The second is the protection of the physician. The physician is often called to attend a married woman in an abortion, which, so far as he knows, is accidental. It sometimes happens that the abortion is self-induced, or brought on by a professional abortionist. In that case, should the woman die, the physician is placed in a rather awkward position. If he is called to treat a fatal case of peritonitis and it is discovered afterward that the woman had an abortion he will have great difficulty in clearing himself. As a matter of fact, many physicians do report cases of abortion. Some report to the coroner, others to the district attorney. Some report all cases, whether they suspect anything criminal or not, in order that they shall be protected should a fatal termination occur; some report only when they suspect that a crime has been committed; some report only when they think the patient is going to die. The question that I would like answered is: Who should be notified when a physician desires to report a case of abortion? In my opinion, it is the registrar, or health officer, rather than the coroner, or district attorney. The third point was brought out by one of the speakers, namely, the education of the people. People have an idea that a fetus is not a living person and does not amount to anything; that to bring on an abortion is of no consequence at all. If every product of conception were regarded the same, if all women were made to realize that the passage of a product of conception through the birth canal is a birth, and the death of the fetus is a death, to be reported just the same as ordinary births and deaths, they would begin to realize that there is something serious in bringing on abortions, and no doubt the morals and the health and the welfare of the community would be advanced.

POPULAR EDUCATION AS A STIMULUS IN PUBLIC HEALTH WORK

W. M. BRUMBY, M.D.
President of the Texas State Board of Health
AUSTIN, TEXAS

In this paper I have made no effort to treat the subject of public health administration exhaustively, nor have I referred extensively to methods in use by other hygienists of the present or the past. I have simply stated some conclusions, together with the data on which they are founded, and in a way this paper is like a case report, dealing with my own work.

I have long been of the opinion that there are two distinct aspects of state medicine. One of these is knowing the remedy to be applied, and the other is knowing how to get the people to apply the remedy. The first consideration I take for granted as a requisite possessed by every good sanitarian. The second consideration—how to get the people to apply the remedy—is the main theme of this paper.

There are men, and intelligent men, who believe that the sanitarian, having decided on what he believes is the wisest course, has nothing left to do but to sail that course, regardless of public opinion. The sanitarian is a specialist in his line. He knows better than the public what health measures are needed. It is a sacred obligation with him to act in accordance with what he knows to be right, let the people believe what they will. This view is the correct one whenever the sanitarian has authority and means necessary to carry his plans into execution. But there are many reforms needed in our

country which are at present outside the authority of the health officers. To secure the authority and means to enact the needed reforms is the task of the sanitarian.

This brings us face to face with the question how the people can be induced to yield the authority and money for the purpose of combating the diseases which menace the public health. To meet this issue successfully the sanitarian must possess a certain degree of tact, political ability, or statesmanship—call it what you may. He must be able to divert a part of the sum total of political power invested in the people and guide it into certain channels.

In doing this the sanitarian does not deal with the populace directly, but with representatives of the people, public officers. These officers draw their powers from the rank and file of the citizens. While to a certain extent they are leaders, yet they are to a great extent followers of public opinion. Personally they are willing to do anything to help the cause of sanitation, but before "going on record" as favoring the establishment of an improved water-works system, for instance, they usually delay action until popular clamor makes itself heard in favor of the proposed reform.

Vox populi is *vox dei.* The sovereign people are the fountainhead of all authority in a free republic, and to get the authority, or the money, which is the sinews of war against disease, it is necessary to go to that fountainhead. If you stop short of the fountainhead, there is always some one else upstream from you who is diverting the current.

I have found that one most excellent method of reaching the people is through the newspapers. In the administration of almost any health officer, there occur events of great value as "news." In giving these news items to the press, it is well to sandwich in a miniature lecture on sanitation with each news item. Of course, if the tidbit of news is ballasted too heavily with scien-

tific "dope," it will never escape the waste-basket. But in dozens of cases, an interview from the health officer, telling "how it happened" is warmly welcomed by the press, even though the interview read like a primer on sanitation.

Next to his ubiquitousness the most characteristic thing about the average newspaper reporter is his skill in getting things wrong. This makes it necessary to prepare certain important interviews and hand them in already written to the newspapers. It is easy to overstep the line here and overlook the newspapers.

In newspaper work, as in every other branch of hygienic education, cooperation by different health officers and physicians is very important. Public meetings participated in by the lay and professional public are an excellent means of stimulating sanitation. The physician has by dint of hard labor become master of a certain amount of that divine attribute called knowledge. The public is hungry for this knowledge; people never fail to avail themselves of an opportunity to stand by and pick up the crumbs from a medical conversation. The public meeting offers the health officer an opportunity to dole out to them such store of his knowledge as they can digest and assimilate. To get best results it is absolutely necessary that no physicians should stand aloof and criticize. Therefore, careful organization is a prerequisite.

Closely related to these public meetings are the so-called traveling institutes of hygiene, as elaborated by my friend, Dr. Mayer, of Louisiana. The "tuberculosis exhibits" are all special phases of his original idea, which was promulgated years before the awakening on the subject of phthisis. The traveling exhibit, consisting of pictures, models, charts, figures, and other accessories are valuable because they stimulate interest and also because they make the subject-matter easier to grasp. Concrete facts are learned easily, and the eye aids the brain in learning the scientific data presented

in one of these traveling institutes of hygiene. I am of the opinion that the typhoid fly should be included in these exhibits as well as the tuberculous cow. I think the vaccination problem should be explained and pictures bearing on it exhibited. In certain of the southern states the malarial mosquito should be explained. In short, I think that traveling exhibits are needed to teach the whole of sanitation and preventive medicine, as well as tuberculosis.

In this connection it occurs to me that the state boards of health are in a position to aid the counties or cities by sending on request a lecturer and demonstrator with an exhibit. The peculiar quality of mind which leads the people to heed the advice of a stranger, where they ignore the words of their lifelong friends, is proverbial. For this reason the health officer of County A can go over to County B and lecture with splendid results. Later, the health officer from County B, looked on as a commonplace man in his own county, can come over into County A and preach sanitation with results just as brilliant.

In a similar way, the U. S. Public Health and Marine-Hospital Service can materially assist each individual state in the battle for better public health. The surgeon who is an officer in this distinguished service enjoys a prestige and renown commensurate with the great corps to which he belongs. The public looks up to him. His words are heeded. Furthermore, his official position is a guarantee that he will be free from any local prejudice. The public does not suspect his motive. He is probably not even a resident of the state in which he may lecture, and may expect to leave that state immediately, possibly never to return. Under these circumstances his words have an unusual burden of meaning which make them productive of much good. I then would call your attention to the fact that cooperation between county and state, and between state and nation, is essential to the best interests of public health.

In conclusion, I desire to refer to one phase of public health administration which frequently causes embarrassment, especially in the southern and western states. I refer to the fact that many of our public health officers are engaged in the private practice of medicine. This is at present a widespread condition, and one that is as natural as for water to run down hill. But it very seriously hampers the cause of public health. The health officer may be entirely conscientious and I take it for granted that he is, and that he does his work thoroughly. The fact remains, however, that his competing fellow practitioners of medicine look askance at any public utterances which he may make. The "publicity side" offends them. They want him to keep himself in the background. Now, no health officer can do his duty without appearing in the lime-light from time to time. Hence he is driven to do one of two things—either offend his fellow practitioners by coming out in the open, or compromise his conscience by lying low and letting things drift. He has no choice between the two. The only logical result will be in the end that health officers will be paid to do their work, so they will not have to do practice on the side to gain a livelihood. We should work toward that end, remembering that for the present we must do the best we can with the means at our disposal.

ABSTRACT OF DISCUSSION

DR. WILLIAM PORTER, St. Louis: The education of the people underlies all activity and organization in this work. People must know. Once having knowledge they will support that which touches their lives and homes and happiness. It is well, it is necessary, to have men fitted to give this instruction, and these men or others should be ready to direct the growth and movement which will surely come in the wake of public instruction. In the masses, even in the most ignorant parts of our cities, where crowded, congested living is most pitiable, is a latent force which once aroused is potent for good, and for progress. In St. Louis is a man whose home and early life was in the worst ward of the city. His associations were bad; he grew up thoughtless and careless; his name was synonym for leadership among the worst classes. Slowly but surely the

desire came to him to do something for his associates. In so doing he lifted himself. He saw a great light—to-day he is an honored state senator, one of the best helpers we have in all that pertains to the uplift of the needy and the limitation of disease. It is such influences as these, resulting from years of educational work in the field, that has given to Missouri its present beautiful sanatorium for incipient tuberculosis with its half a million appropriation; has given it the Commission on Tuberculosis with its $125,000 for five years' further educational work, and has entered the penitentiary with an investigating committee and aids in the segregation of convicts.

We of Missouri are often asked why our people are so liberal to these causes. It is simply the harvest of the seed that has beeen patiently sown. We are fortunate in that our governor and the mayor of St. Louis are with us, but back of these are the masses—the people on whom we can depend. I urge the use of the newspaper under proper surveillance, the public lecture, and the instruction of the school children by illustration and text-book. The former is an important but delicate matter; the latter is best of all for future results. Every child should have access to lectures and exhibits and carry into the home a well-prepared leaflet with simple notations. Five hundred thousand of these have been carried into the homes of St. Louis by the children of public and parochial schools.

DR. JUAN GUITERAS, Habana, Cuba: There does not appear to be any sustained effort made throughout the South to impress on the people the lessons of experience in the matter of antimosquito campaigns for the prevention of yellow fever and malaria. The cities of the South, I am sorry to say, are still trusting solely to methods of quarantine that have been proved in the past, on many occasions, to be inadequate. Unfortunately, the great object lesson offered by Cuba has not been brought clearly before the people; on the contrary, in some quarters an effort has been made to obscure it. The success of Cuba in keeping down and within reasonable limitations the recent visitation of yellow fever in that country, has not been appreciated in the proper spirit by our neighbors of the southern states. During three years of our recent visitation (1905-1908) we had nowhere the widespread epidemic manifestations that characterized the days of the Spanish domination there, or of the recent outbreaks of Laredo, New Orleans and Pensacola. The reasons for this difference are two: First, we have never hesitated a moment in announcing the first appearance of the disease, and in taking frankly and openly the necessary step towards preventing its propagation. The press, throughout the South, did not, as a rule, endeavor to show the advantages of such a procedure. On the contrary, the impression was created, with a degree of unfairness which

82

was very unpleasant at times, that the cases were being discovered and made public by state and United States medical representatives in Cuba. The people of the South were usually informed by cable in words to this effect: "The representative of the State Board of Louisiana in Cuba reports three cases of yellow fever to-day in Havana;" or another officer would cable: "I found a case of yellow fever to-day at Las Animas Hospital," and so forth. Now, as a matter of fact, the cases were invariably discovered, shown, and reported by the Cuban sanitary authorities, who were most anxious to demonstrate what they considered an essential part of their successful method of controlling the disease. To report the facts otherwise was unfair to Cuba, and it was most unfair to the people of the South who lost thereby the educational advantages that they should have derived from the contemplation of a successful campaign on the basis of a prompt declaration. The second reason of the difference in the results obtained is the maintenance of a persistent and continued fight against the stegomyia. I am afraid that little or nothing is being done in this direction throughout the South.

PROCEEDINGS OF THE SESSION

TUESDAY, JUNE 8—AFTERNOON

The Section was called to order at 2:30 p. m., in the First Baptist Church by the chairman, Dr. J. H. White, New Orleans. In the absence of the secretary, Dr. Marshall Price, Baltimore, was designated secretary *pro tem.*

The Chairman read his address.

Dr. J. N. McCormack, Bowling Green, Ky., delivered his remarks *extempore* on "The Importance of Consolidation of all the National Health Associations Into the Section on Hygiene and Sanitary Science with the Purpose of Making It What It Should Be."

Dr. H. M. Bracken, St. Paul, Minn., read a paper on "The Relation of the Medical Profession to Preventive Medicine."

These two papers were discussed by Drs. George M. Sternberg, Washington; William Porter, St. Louis; Marshall Price, Baltimore; Henry B. Hemenway, Evanston, Ill.; W. A. Evans, Chicago, and Bracken.

Dr. Marshall Price offered the following resolution, which was referred to the House of Delegates:

Resolved, That the Chairman appoint a committee of three to consider means of cooperation with the American Public Health Association and the Conference of State and Provincial Boards of Health, and that in addition to these three members the Chairman be also *ex officio* a member.

Dr. Hemenway offered a resolution declaring that not sufficient time is devoted to sanitary science in medical colleges. [This resolution appeared in full in the minutes of the House of Delegates, THE JOURNAL, June 19, 1909, p. 2083.]

Dr. Hemenway also offered the following resolution, which was referred to the House of Delegates:

Resolved, That the representative on Hygiene and Sanitary Science in the House of Delegates be instructed to ask that a permanent council on sanitary science be appointed by the American Medical Association and that a special department on sanitary science be regularly maintained in THE JOURNAL of the Association under supervision of this council.

Resolved, That the Association be requested to appropriate a suitable sum of money for the use of the council on sanitary science.

Dr. S. A. Knopf, New York City, read a paper on "A New Type of Phthisiophobia." The paper was received without discussion.

WEDNESDAY, JUNE 9—MORNING

The Oration on State Medicine was delivered by Dr. John S. Fulton, Baltimore.

Dr. W. M. Brumby, Austin, Texas, then read a paper on "Popular Education as a Stimulus in Public Health Work." This was discussed by Dr. William Porter, St. Louis, and others.

Dr. P. H. Bergey, Philadelphia, read a paper on "Preservatives in Food Materials, Their Detection and Effects." This was discussed by Dr. J. N. Hurty, Indianapolis, Dr. Bergey, and others.

Dr. Henry P. Hemmenway, Evanston, Ill., read a paper on "The Limitations of Public Health Administration." This was discussed by Drs. Clemmer, Columbus, Ohio; Hurty, Indianapolis; Bracken, Minnesota; Hemmenway, and others.

A resolution was introduced by Dr. L. H. Montgomery, Chicago, calling for the appointment by the Chairman of a committee of three to draft suitable resolutions on the death of Dr. Charles Harrington. The resolution was adopted, and Drs. Fulton, Egbert and Montgomery were appointed.

WEDNESDAY, JUNE 9—AFTERNOON

Dr. Harry C. Sharp, Indianapolis, read a paper on "Vasectomy as the Means of Preventing Procreation in the Defectives." Discussed by Drs. Liston H. Montgomery, Chicago; Ferd. C. Valentine, New York City; W. Forrest Dutton, Walker's Mills, Pa.; Woods Hutchinson, New York City; C. A. Rosenwasser, Newark, N. J.; George N. Jack, Buffalo; J. N. Hurty, Indianapolis, and Sharp.

Dr. W. A. Evans, Chicago, read a paper on "Lake Michigan Water for Drinking Purposes."

Dr. Harold B. Wood, Philadelphia, read a paper on "The Economic Value of Protecting the Water Supplies."

These two papers were discussed by Drs. W. K. Jaques, Chicago; Liston H. Montgomery, Chicago; W. Forrest Dutton, Walker's Mills, Pa.; Seneca Egbert, Philadelphia; Marshall Langton Price, Baltimore; John S. Fulton, Baltimore; Arnold, U. S. Navy; F. W. Sell, Rahway, N. J.; J. H. White, New Orleans; Evans and Wood.

THURSDAY, JUNE 10—MORNING

The following officers were elected: Chairman, Dr. J. N. Hurty, Indianapolis; vice-chairman, Dr. C. F. Williams, Columbia, S. C.; secretary (three years), Dr. M. Langton Price, Baltimore; delegate, Dr. J. H. White, New Orleans;

alternate, Dr. C. L. Wheaton, Chicago; orator, Dr. Seneca Egbert, Philadelphia.

The Chairman, empowered by a motion offered by Dr. Henry B. Hemenway, Evanston, Ill., appointed Drs. H. M. Bracken, W. A. Evans and Seneca Egbert a committee to cooperate for one year with the Committee on Legislation, through its bureau.

Dr. Francis H. Slack, Boston, was, on the suggestion of Dr. H. M. Bracken, St. Paul, appointed secretary in the temporary absence of Dr. Price, acting secretary.

Dr. John W. Kerr read a paper by himself and Dr. J. W. Stimson: "The Prevalence of Rabies in the United States." Discussed by Drs. H. M. Bracken, St. Paul; W. A. Evans, Chicago; W. M. Brumby, Austin, Tex.; John F. Anderson, U. S. P. H. and M.-H. S.; W. Forrest Dutton, Walker's Mills, Pa.; Gates, U. S. Navy; Kerr; W. H. Sanders, Mobile, Ala.; J. N. Hurty, Indiana; Liston H. Montgomery, Chicago; Martin Friedrich, Cleveland, Ohio; William Litterer, Nashville, Tenn.; A. C. Abbott, Philadelphia; Guiteras, Havana, Cuba.

Dr. Price, acting secretary, adverting to his election, during his absence, as secretary for three years, gave notice that he could not serve for more than one year, ensuing.

Dr. W. Forrest Dutton, Walker's Mills, Pa., read a paper on "Insect Carriers of Typhoid Fever."

Dr. Willard J. Stone, Toledo, Ohio, read a paper on Typhoid Immunity and Antityphoid Inoculations."

Dr. L. L. Lumsden, U. S. P. H. and M.-H S., read a paper on "Epidemiologic Status of Typhoid Fever."

These three papers were discussed by Drs. George M. Sternberg, Surgeon General, U. S. Army; Henry B. Hemenway, Evanston, Ill.; Guiteras, Havana, Cuba; A. C. Abbott, Philadelphia; Liston H. Montgomery, Chicago; Seneca Egbert, Philadelphia; J. N. Hurty, Indianapolis; Freeman, Virginia; Russell, U. S. Army; J. B. Bullitt, University, Miss.; Gardiner T. Swartz, Providence, R. I.; Martin Friedrich, Cleveland, Ohio; H. M. Bracken, St. Paul; William H. Welch, Baltimore; Dutton and Lumsden.

Resolutions offered by Dr. W. M. Brumby, Austin, Tex., seconded by Dr. Gardner T. Swartz, Providence, R. I., were adopted and referred to the House of Delegates [which body adopted them]. They were as follows:

WHEREAS, The American Medical Association, not only as one of its declared purposes, but by numerous lines of activity, many of them connected with the Section on Hygiene and Sanitary Science, stands committed to the education of the public with respect to the nature and prevention of disease, and

WHEREAS, The demand for such popular education with respect to tuberculosis, cancer, typhoid fever and other decimating diseases has become urgent; therefore, be it

Resolved, That all county, district and other local medical societies be and they are hereby requested to hold annually one or more open meetings to which the public shall be invited and which shall be devoted to a discussion of the nature and prevention of disease and to the general hygienic welfare of the people.

Resolved, The the women physician members of the American Medical Association, be and they are hereby requested to take the initative individually in their respective association in the organizaton of educational committees to act through women's clubs, mothers' associations and other similar bodies, for the dissemination of accurate information touching these subjects among the people and that they be requested to submit to the House of Delegates a yearly report of such work, and elect from among their number a committee to take charge of the same.

Resolutions offered by Dr. John S. Fulton, Baltimore, seconded by Dr. Price, urging more complete registration of vital statistics, were referred to the House of Delegates. [No action on these resolutions is recorded in the minutes, see page 2083 of THE JOURNAL, June 19, 1909.]

THURSDAY, JUNE 10—AFTERNOON

Dr. Seale Harris, Mobile, Ala., read a paper on "The Prevention of Malaria." Discussed by Drs. Marshall Langton Price, Baltimore; Henry B. Hemenway, Evanston, Ill.; W. Forrest Dutton, Walker's Mills, Pa.; Guiteras, Havana, Cuba; J. N. Hurty, Indianapolis; Seneca Egbert, Philadelphia; J. R. Kean, Havana, Cuba; Liston H. Montgomery, Chicago; J. H. White, New Orleans; Neale, Chicago; C. F. Williams, Columbia, S. C., and Harris.

Dr. Myer Solis Cohen, Philadelphia, read a paper on "The Notification to the Local Health Authorities of Cases of Abortion and Miscarriage." Discussed by Drs. W. Forrest Dutton, Walker's Mills, Pa.; Marshall Langton Price, Baltimore; J. N. Hurty, Indianapolis; Seneca Egbert, Philadelphia; W. M. Brumby, Austin, Tex.; C. H. Jones, Baltimore; Henry B. Hemenway, Evanston, Ill., and Cohen.

A resolution of regret was adopted concerning the unavoidable absence of Dr. Lewis, ex-chairman of the Section, with a request to the secretary that he communicate the resolution of regret to Dr. Lewis and the wish for his speedy recovery.

The written resignation, because of illness, of Dr. S. T. Armstrong as secretary for 1910 and 1911, the unexpired years of his term, was read and on motion accepted.

On motion of Dr. W. Forrest Dutton, Walker's Mills, Pa., the Section passed a vote of thanks to Dr. Armstrong for his services, with instructions that same be forwarded to him.

Dr. Francis Dowling, Cincinnati, read a paper on "The French Tobacco Factory at Issy, near Paris: Hygienic Notes." Discussed by Drs. W. Forrest Dutton and Dowling.

Dr. J. H. White, chairman, appointed Drs. Henry M. Bracken of Minnesota and Marshall Langton Price of Maryland as the two members of this Section to act in conjunction with the chairmen of three of the standing committees of the association in arranging for permanent legislation in the matter of having a council.

On motion of Dr. Liston H. Montgomery, Chicago, the Section passed a vote of thanks to the retiring chairman, Dr. J. H. White, for his courtesy and painstaking care and efficiency in the discharge of his functions; whereupon the Section adjourned, *sine die*.

[NOTE: In the proceedings of the House of Delegates of the American Medical Association, at this session, there appears a record (THE JOURNAL, June 19, 1909, page 2078) to the following effect:

A resolution, proposed by Dr. F. A. Knopf of New York, and seconded by Dr. Marshall L. Price of Maryland, was adopted by the Section on Hygiene and Sanitary Science, and the delegate of that Section, Dr. C. L. Wheaton, was instructed to present it to the House of Delegates of the American Medical Association:

Resolved, By the Section on Hygiene and Sanitary Science, that it is the sense of the Section that its name—Section on Hygiene and Sanitary Science—should be changed to that of Section on Preventive Medicine and Public Health.

On motion this resolution was referred to the Reference Committee on Sections and Section Work, which, later, reported favorably and the House, by motion, duly passed, adopted the new name.]

INDEX

PAGE

Abbott, A. C.: discussion on rabies....83, 84
Discussion on typhoid 150
Abortion and miscarriage, notification to health authorities in; paper by M. S. Cohen.... 203
Discussion 207
Anderson, J. F.: discussion on rabies.... 81
Bergey, D. H.: paper on preservatives in food.... 15
Bracken, H. M.: paper on preventive medicine.... 178
Discussion on rabies 79, 84
Discussion on typhoid.... 156
Brumby, W. M.: paper on popular education in public health work 212
Discussion on rabies 80
Discussion on registration of births.... 209
Bullitt, J. B.: discussion on typhoid.... 155
Clemmer, J. W.: discussion on public health administration... 38
Cohen, Myer Solis: paper on notification of abortion and miscarriage 203
Discussion on same 211
Donaldson, W. H.: discussion on registration of births..... 209
Dowling, Francis: paper on French government tobacco factory 85
Discussion on same 92
Dutton, W. Forest: paper on insect carriers of typhoid..... 99
Discussion on same.... 156
Discussion on malaria.... 171
Discussion on rabies.... 81
Discussion on registration of births....207, 208
Discussion on tobacco.... 91
Discussion on vasectomy....198, 200
Discussion on water-supplies.... 60
Egbert, S.: discussion on malaria.... 173
Discussion on registration of births.... 209
Discussion on typhoid.... 158
Discussion on water-supplies.... 60
Evans, W. A.: paper on Lake Michigan water for drinking... 39
Discussion on same.... 62
Frederick, M.: discussion on rabies.... 82
Freeman, A. W.: discussion on typhoid.... 154
Friedrich, M.: discussion on same.... 156
Fulton, J. S.: discussion on water-supplies.... 61
Gates, M. F.: discussion on rabies.... 81
Guiteras, J.: discussion on malaria.... 171
Discussion on popular education in sanitation..... 217
Discussion on rabies.... 84
Discussion on typhoid.... 150
Harris, Seale: paper on prevention of malaria.... 159
Discussion on same....174, 175, 176

PAGE
Hemenway, H. B.: paper on public health administration.... 24
Discussion on malaria..... 171
Discussion on registration of births..... 210
Discussion on typhoid..... 149
Hurty, J. N.: discussion on malaria..... 172
Discussion on rabies 82
Discussion on registration of births.....208, 209
Discussion on typhoid.....153, 154
Discussion on vasectomy..... 200
Hutchinson, W.: discussion on vasectomy..... 198
Jacques, W. K.: discussion on water-supplies..... 58
Kean, J. R.: discussion on malaria..... 173
Kerr, John W.: paper on rabies in the United States..... 66
Discussion on same..... 81
Knopf, S. Adolphus: paper on a new type of phthisiophobia.. 93
Litterer, W.: discussion on rabies..... 83
Lumsden, L. L.: paper on typhoid..... 132
Discussion on same 157
Malaria, prevention of; paper by S. Harris..... 159
Discussion 170
Michigan (Lake) water for drinking; paper by W. A. Evans... 39
Discussion 58
Montgomery, L. H.: discussion on malaria..... 174
Discussion on typhoid 152
Discussion on water-supplies..... 59
Discussion on vasectomy..... 197
Neale, R. A.: discussion on malaria..... 176
Patton, G. F.: discussion on malaria..... 175
Phthisiophobia, a new type of; paper by S. A. Knopf..... 93
Porter, W.: discussion on popular education in sanitation..... 216
Preservatives in food; paper by D. H. Bergey..... 15
Preventive medicine; paper by J. H. White..... 9
Preventive medicine and the medical profession; paper by H. M. Bracken 178
Price, M. L.: discussion on malaria.....170, 174
Discussion on registration of births....207, 208, 209, 210
Discussion on water-supplies..... 61
Public health administration, limitations of, paper by H. B. Hemenway 24
Discussion 38
Public health work, popular education in; paper by W. M. Brumby 212
Discussion 216
Rabies in the United States; paper by J. W. Kerr and A. M. Stimson 67
Discussion 79
Rosenwasser, C. A.: discussion on vasectomy..... 199
Russell, F. F.: discussion on typhoid..... 154
Soll, F. W.: discussion on water-supplies..... 62
Sharp, Harry C.: paper on vasectomy..... 186
Discussion on same 201
Sternberg, G. M.: discussion on typhoid..... 148
Stimson, A. M.: paper on rabies in the United States..... 66
Stone, Willard J.: paper on typhoid immunity and antityphoid inoculation 117
Swartz, G. T.: discussion on typhoid..... 156

PAGE
Tobacco factory, French government; paper by F. Dowling.... 85
Discussion 91
Typhoid, epidemiologic studies of; paper by L. L. Lumsden... 132
Discussion 147
Typhoid immunity and antityphoid inoculation; paper by W. J. Stone 117
Discussion 147
Typhoid, insect carriers of; paper by W. F. Dutton 99
Discussion 147
Valentine, F. C.: discussion on vasectomy..... 197
Vasectomy in defectives; paper by H. C. Sharp..... 186
Discussion 197
Water-supplies, economic value of protecting; paper by H. B. Wood 48
Discussion 58
Welch, W. H.: discussion on typhoid..... 147
White, J. H.: paper on preventive medicine..... 9
Discussion on malaria.....174, 175
Discussion on water-supplies..... 62
Wood, Harold B.: paper on water-supplies, economic value of protecting 48
Discussion on same 64

41C
623